MODEL AIRPLANE NEWS

AUGUST 1958 — [illegible]

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ee page 26

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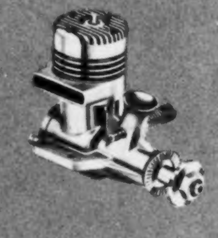

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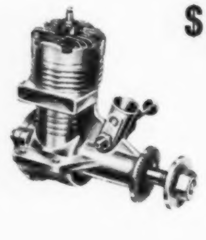

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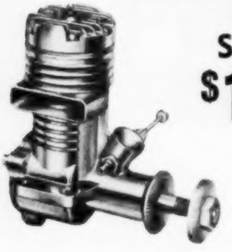

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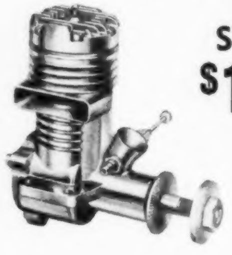

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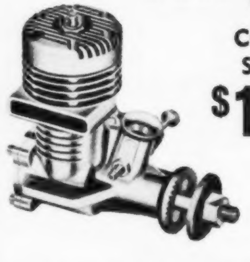

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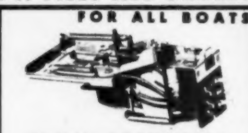

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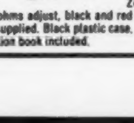

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P. G. F. CHINN

Foreign Notes

SOUTH AFRICA

► This year's South African Nationals were held at Capetown and included, as usual, events for most classes. The meet also embraced the FAI eliminators for the Wakefield and F/F Gas teams for the forthcoming World Championships. The top Wakefield jobs performed well on their 50 grams of rubber and showed a surprisingly good climb, the honors going to the well-known S.A. Wakefielders Rowe and Visser, with third place taken by a junior flier, H. Altman. Of Altman, our on-the-spot reporter, Pete Visser, comments: "He is fortunate in having a first-class father, who shows exceptional tree-climbing ability: I can vouch for this as he rescued my job from a high tree after I had given it up for lost."

FAI power saw a win for Brian Partridge flying an Olive-Cub .09 Diesel powered Calypso (English kit model), followed by Visser and Altman flying Dream-Weavers (English design by Dave Posner) powered, respectively, by Oliver-Tiger and Webra Mach-1 .15 Diesels. In this year's event, incidentally, the glow plug engined jobs showed up much less favorably than at the '56 and '57 contests which were held at high inland altitudes where the diesels appeared to be at a disadvantage. One would also expect the diesels to have some advantage under the new rules with their 50% increase in wing-loading requirements.

In the unrestricted gas events, American designs and motors were well to the fore, with Spacers this year outperforming the Ramrods that were last year's sensation. Winning motors included Atwood Shriek, Allen-Mercury .06, K&B 19 and K&B 23.

Radio was better than ever, with particular emphasis on multi, following the tremendous fillip given by Howard Bonner's visit last year. Winner of the multi event was C. Culverwell's Astro Hog with Orbit equipment and powered by a Veco 35. Fred Raubenheimer won the Intermediate and Rudder-only classes.

In the U-control events, R. Lee won the B Class team race using a Torpedo 29R and A Class also provided a K&B victory when 15-year-old D. Coetzee's Torp 15 surprisingly vanquished the fancied experts' Oliver-Tigers. The ½A Class proved a walkover for Partridge's Oliver-Cub job. Bob Palmer's Thunderbird was the stock equipment in stunt and won both the senior and junior events.

JAPAN

After some delay, the O.S. Max-35 variable-speed RC engine, first described in this column last year, is now available. The engine is fitted with an exhaust valve and coupled intake butterfly and similarly equipped versions of the Max-II 15 and 29 are also being produced. The complete speed control unit can be fitted to the current Max-II versions of the 35, 29 and 15 bv drilling and tapping the special lugs inside the exhaust stack which are provided on these models. The RC versions can also be readily converted to the standard type. The speed control units are nicely made and work very smoothly.

Big motors in the .60 cu. in. class are not so plentiful these days, but there is still a steady demand and it was good to

(*Continued on page* 7)


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AUGUST 1958 Vol. LIX, No. 2

CONTENTS

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by William Winter

► The well-filled auditorium of the Charles Evans Hughes High School, on New York's west side, was the scene, Saturday, May 3rd, of a hobby gathering reminiscent of the Junior Birdmen rallies of the late twenties and early thirties. But this was a Rocket Symposium, put on by the First Army, with headquarters at Governor's Island in New York Harbor. Upwards of 600 amateurs, from as far away as Watertown, N. Y., and Providence, R. I. were in enthusiastic attendance. Movie news cameras whirred, and the flashing of photographer's bulbs lent a political convention atmosphere. (On page 11, will be found some representative pictures.) MAN at Work and Berkeley's Bill Effinger kept each other company in these "strange" surroundings. No familiar faces were to be found.

During the morning, rockets and gadgets of all sizes and shapes, were on display throughout the school corridors. Some were marvels of complexity, others, we fear, were not so hot. The afternoon's session went like clock work —the Army was running it. Industry authorities on fuels, guidance, ignition, safety—even a Congressman, gave brief talks with question-and-answer periods set up afterwards in various school rooms. The modelers' old friend, the New York Mirror, who puts on the annual Mirror Meet, footed the bill.

Amateur rocketry, of course, has become a national headache. Some 10,000 members belong to clubs, and the number grows. Some know what they are doing. Others don't. Attracted by carefree newspaper stories, tens of thousands of "free lance" hobbyists are, for the most part, a threat to themselves, others, and amateur rocketry itself. Magazines who don't cover this stuff are accused of being unprogressive. Specific how-to-do-it information undoubtedly will lead to even more accidents and yet, the organized, supervised groups in schools, and so on, must have such information.

The great, underlying question is how much of this is fad and how much is legitimate and scientific. Alarmed national agencies discuss possible action in the name of common sense, but hesitate for fearing of making things worse, or of killing off evident interest in science.

The subject is much too complex to be dealt with within the confines of this column. For this issue, MAN at Work makes the special report that begins on page 9.

NEXT MONTH'S COVER Curtiss Robin

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ABOUT THE COVER

The spirit of youth and the future is suggested in the classic color picture made by Gene Hooker. The young lad is Paul Del Gatto, Jr. and the Jetex rocket is the model shown on page 26. An almost portrait quality of the photograph makes even more subtle composition finepoints that our amateur photographers will appreciate.


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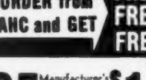

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Foreign Notes

(*Continued from page* 2)

have the opportunity to examine the current Enya 60 model from the Enya Metal Products Company of Tokyo.

The 60 comes with a full 12-month guarantee and when you look at it, you can see the reason why. The Enya 60 is surely one of the toughest model airplane motors ever built. To start with, the main castings are finely finished sand castings of great strength, mounting lugs are nearly 5/16-in. thick and the substantial, bronze-bushed front bearing assembly is attached with six screws. The counterbalanced and hardened crankshaft has a 14 mm. (nearly 9/16-in.) journal and an 8 mm. (over 5/16 in.) crankpin and weighs almost 3 oz. The conrod is a really rigid affair with an offset shank to clear the shaft counterweight and has a small end bearing over ½-in. wide for the ¼-in. dia. wristpin.

A novel feature is a detachable exhaust stack which diverts spent gasses and residual oil clear of the engine without unduly restricting top performance. As on other Enya engines, the head joint is metal-to-metal.

The Enya 60 is not a volume production item and only about 3,200 of this and the earlier 63 model have been made in the last six years. The current motor has a bore and stroke of 0.944 x 0.865 in. and weighs 14 oz.

GREAT BRITAIN

For the past year or so there have been unpublicized signs that Britain RC, long in the doldrums, is at last making some real progress. Now, with the first 1958 contests under way, the fruits of some of these behind-the-scenes developments have been seen.

Two modelers who rate a special mention here are Stewart Uwins and Chris Olsen. Using six-channel reed-equipment built by Olsen and operating rudder, motor and elevator through quick action self-centering motor-servos, they were notable entries in the season's opening RC contest at Chalgrove airfield organized by the Aircraft Radio Control Club. Uwins proved to be the winner of both the main events and both fliers gave a display of aerobatic flying much above the standards hitherto seen in British contests.

Uwins and Olsen know the risks and write-offs that go with the advancement towards true stunt flying. In a two year period, some two dozen models were actually built, culminating in their present design, a 6¼-lb ship with 80-inch symmetrical section wing and a Fox 29 motor.

In the British commercial RC field, the emphasis is still on single-channel outfits, E.D. being the only producer to offer multichannel (3 and 6 reed) equipment. A newcomer to the single-channel market is Ripmax with the new low-priced Pathfinder gear costing $29.54 for both transmitter and receiver. A novel merchandising scheme with this is the RDA (Receiver Demonstration Aid) unit which is supplied to accredited dealers. This consists of a neat, molded base with built-in indicator lamp and containing all receiver batteries. Receiver for demonstration is simply placed on this and plugged into a socket at the side. The customer is then assured that the equipment is in working order when he buys it.

AUSTRALIA

Maybe Chet Lanzo and Dick Korda and others of the pre-war Cleveland rubber group who used to favor small surface spars had something. While the rest of us strove for a "clean" wing with no bumps, they won the contests and set the records. Nowadays we talk of turbulators and boundary

(*Continued on page* 46)

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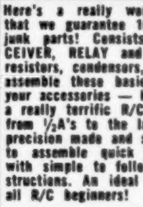

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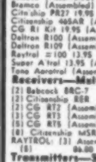

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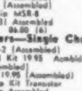

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Citizenship 465AR (Assembled)	24.95
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Deltron R109 (Assembled)	29.95
Raytrol #100 13.95 200	19.95
Super A'trol 13.95 (Assembled)	19.95
Tone Aerotrol (Assembled)	34.95

Receivers—Multi Channel

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(2) Citizenship RER	39.95
(2) CG RT2 (Assembled)	69.95
(3) CG RT3 (Assembled)	79.95
(5) CG RT5 (Assembled)	119.50
(8) Citizenship MSR-8	99.95
RAYTROL: (3) Assembled	64.50
(5) 86.00 (6)	91.75

Transmitters—Single Channel

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Badeco (Assembled)	34.95
Citn'ship Kit 19.95 (Assembled)	24.95
MTK Citn'ship Kit Transistor	21.95
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Citizenship 465MC Transistorized	26.95
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CG T12 Kit 22.95 (Assembled)	31.95
Deltron T99 (Assembled)	21.95
Deltron T100 (Assembled)	29.95
Raytrol 500X (Assembled)	34.95
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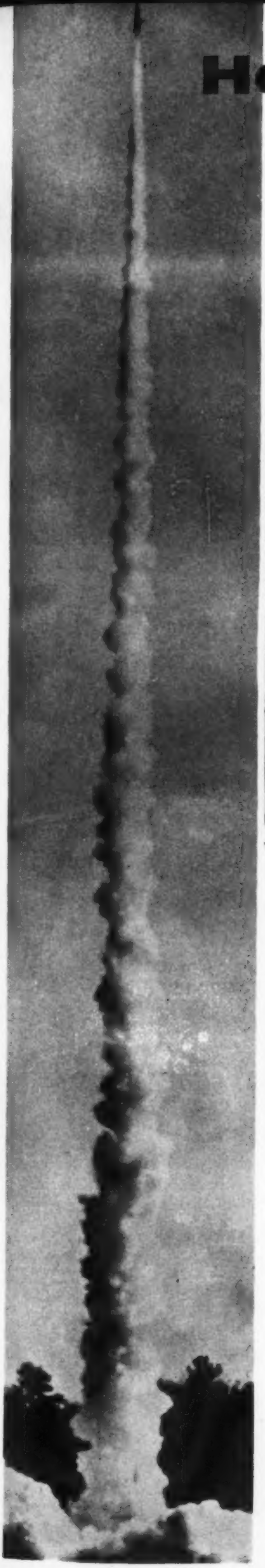


How Safe Are Rockets?

by WILLIAM WINTER

In the wake of Sputnik 1 came wholesale blast-offs by amateur rocketeers, carefree accounts of junior Canaverals in the papers, and inevitable accidents. What will happen now? In this special report MAN presents info to date.

A STATEMENT BY MAJOR GENERAL H. N. TOFTOY, COMMANDING GENERAL OF REDSTONE ARSENAL, HUNTSVILLE, ALABAMA

. . . . . I certainly do not want to discourage the interest or creative efforts of our young people, but in view of the increasing number of accidents to amateur rocketeers, I feel I must point out the extreme hazards involved . . . . . I would not think of personally handling substances that create rocket propellants in my home workshop . . . . .

First, don't experiment with liquid fuels like liquid oxygen, nitric acid, and gasoline at all.

The problems involved are almost insurmountable except for an expert missileer with highly accurate and expensive equipment. Special valves to control the flow of liquid fuels require high-quality machine work. Also needed for liquid fuel rockets is a complex ignition system that just can't safely be fabricated in a basement.

As for solid propellants, a "binder" is vital. Loose powders simply cannot be packed tightly enough to avoid grave danger of explosion. A solid propellant charge must be thoroughly mixed. Cracks and air bubbles are as great a source of danger as loose powders.

Such substances must be heated to make them liquid and the danger lies in over-heating which leads to an explosion.

The best and safest way to make a rocket is to acquire a technical education and then get a job with a professional rocket research organization.

* * *

Released by Headquarters, First U. S. Army, information Section, 10 February 1958.

Wide World Photos

When Connecticut banned firing, Navy brought these high students to Virginia test range. It fizzled.

Students from three New York high schools set up a rocket-launching display for school hobby telecast.

► What is amateur rocketry? Is it the kid who mixes deadly explosives in the cellar corner? The teen-ager who blasts off a high-velocity missile without regard for people and property? A Professor Goddard, the rocketry pioneer, who experimented when the only reward was ridicule? The boy in the Moses Brown High School, in Rhode Island, whose "shoots" are a model of group planning and execution? The kid in Fair Lawn, N.J., who, with municipal blessing (and supervision), sees his "bird" fly at monthly club "shoots?" Or the small fry hobby shop customer who buys what the real junior rocketeers describe as "toys?" Precisely, who is a rocketeer? And how "safe" is a rocket?

For some time it has been obvious that the rocketeers at Cape Canaveral who fire "the real thing" had quality but, compared with certain widespread and mysterious goings on, they most certainly did not have quantity. For every Atlas, Thor, Jupiter or Vanguard, a hundred amateur rockets blasted off. And from the darndest places.

On one day, a Brooklyn vacant lot was the launching pad for five separate "shoots." One rocket screamed out of the Red Hook Stadium in that city and, for all that anyone knows, may be in orbit. Another streaked from beneath the Astoria Bridge in New York. Rockets were launched from roof tops and brownstone stoops in Brooklyn and Manhattan. From parks in Flushing and Queens. From quarries. The barrage was nationwide. Who doed it?

To the everlasting credit of the Army, in particular the First Army, with headquarters at Governors Island, New York City, con- (*Continued on next page*)

Wide World Photo

Home-made rocket after 1.3 mile-high-500 mph flight. Holland, Mich. lads were 16 and 17. Bent shape indicates importance of safe sites.

tact was made through newspapers and radio with this phantom army of rocketeers. A questionnaire to "rocket societies" produced remarkable information.

In the First Army's eight-state province, over 1,000 rocket firings took place prior to March 16th of this year. About half of these rocket "men" operated in the most unlikely location of all, the New York metropolitan area. Another 15% lived in close-by northern New Jersey. Nearly three-quarters of these budding scientists were under 15 years of age. Highly important, about 15% were teachers who had organized, or hope to organize, rocket study groups. In such groups lies the real possibilities of amateur rocketry; chancy, individual projects, outside of competent advice, control, and supervision threaten to turn enthusiastic public encouragement (*Continued on page* 28)

MOSES BROWN SCHOOL SCIENCE CLUB

Rocket Program Information Sheet

SAFETY PRECAUTIONS, NOT IN ORDER OF IMPORTANCE; to disregard any of these for the sake of convenience is to invite serious trouble.

1. Permission from all parents whose children attend a rocket launching.
2. A launching site far removed from heavily populated areas; the site should provide adequate protection against injury from flying bits of metal. Rockets capable of reaching extreme altitudes will be fired over the sea.
3. Use of a fuel made up of a mixture of powdered zinc and sulphur. This fuel will not detonate under pressure alone but must be ignited by sustained temperature. No fuel other than the zinc-sulphur mixture is considered.
4. Use of a remote-controlled electrical firing system which puts everyone concerned a safe distance—at least seventy-five (75) feet—from the rocket. Use of a fuse or matches is strictly forbidden.
5. Strict supervision of each launching by the Science Club adviser. Anyone who does not obey the adviser in the matter of taking cover and of remaining clear of the rocket in case of a misfire is not allowed to attend any more firings.
6. In the event of a misfire, the ignition circuit is broken and the rocket is allowed to stand a few minutes before the adviser approaches it. Under no circumstances is anyone to approach a smoking rocket.
7. No one is ever allowed to play with a rocket, and anyone who carries on dangerous work outside of club time or ignores safety rules is immediately expelled from the club.
8. The rocket is fired at an angle of not more than eighty degrees (80) from the horizontal to ensure that it does not fall in the vicinity of the launcher. The launcher itself must guide the rocket for not less than twice the length of the rocket.
9. The club has a qualified adviser.
10. The nozzle of the rocket is not smaller in diameter than one-third the diameter of the fuel section.
11. Seamless tubing is employed.
12. The fuel is never heated when being made; it is simply stirred together. Neither is the mixture used as an igniter heated.

Congressman Francis E. Dorn told the gathering that official support is being sought in Washington, to secure a national program.

Symbolic of Army's interest in amateur rocketry, intention to promote such activity under sensible program, was Lt. Gen. B. M. Bryan.

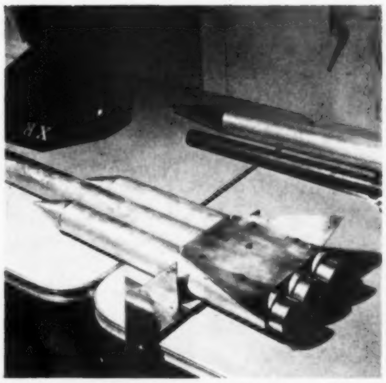
Willy Ley, in rocketry since early days in Germany, was a sensation with lively talk on powdered fuel mixing, through the centuries.

Demonstration—and real dope—on safety by Army rocketeers was most impressive. Controlled blasting-cap explosion was eye opener.

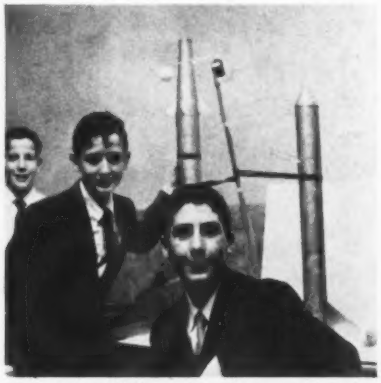
ROCKET SYMPOSIUM

Sponsored by First Army, on May 3, Charles Evans Hughes High, New York.

Girls, too, interested in space. One rocket displayed cost youthful maker $500 to make.



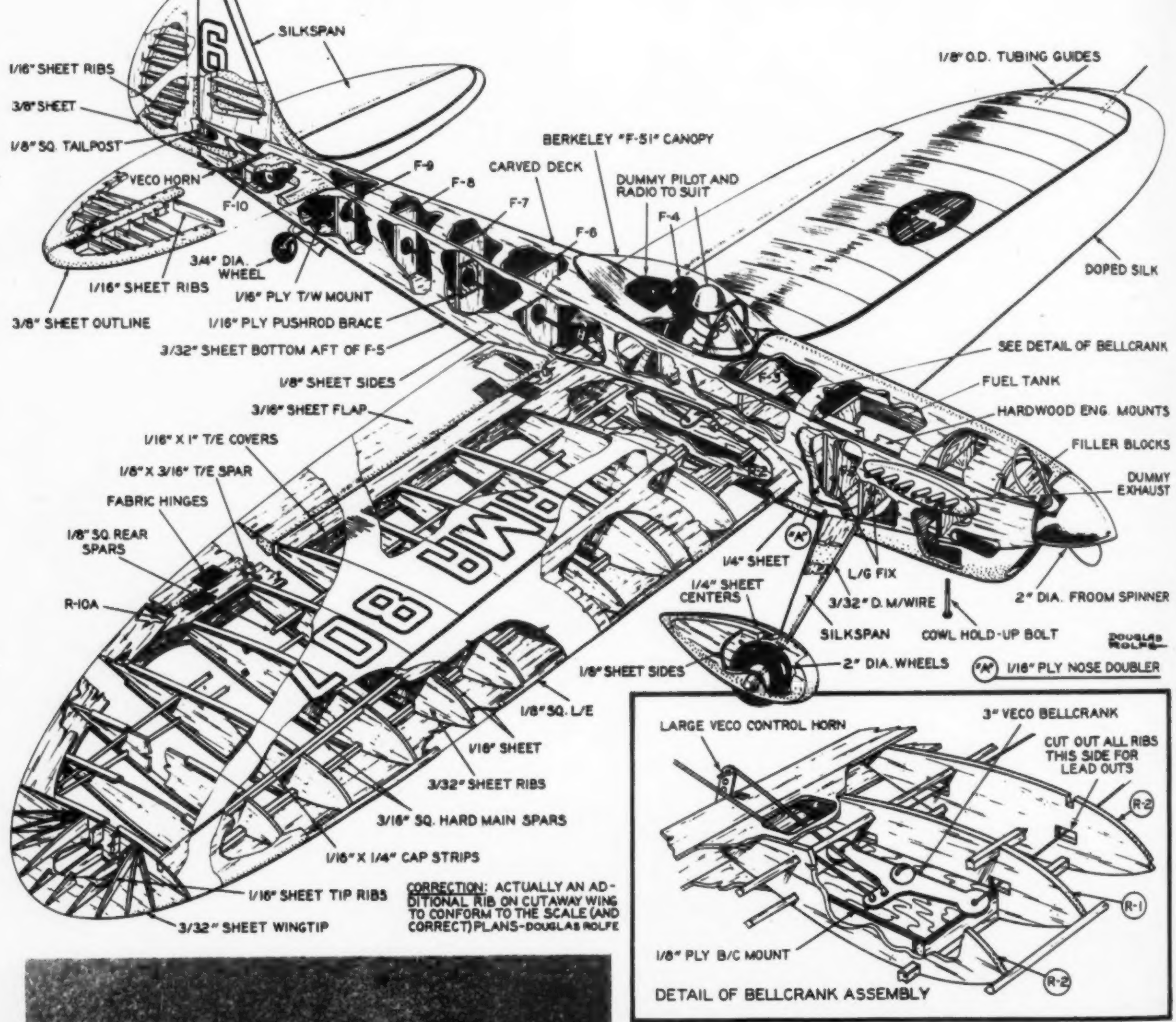
The show abounded with rockets, big and little. Serious, well constructed three-barrel job, this.



These lads call themselves "Spacettes." Project is "Moon or Bust." Electrified ball "orbits."

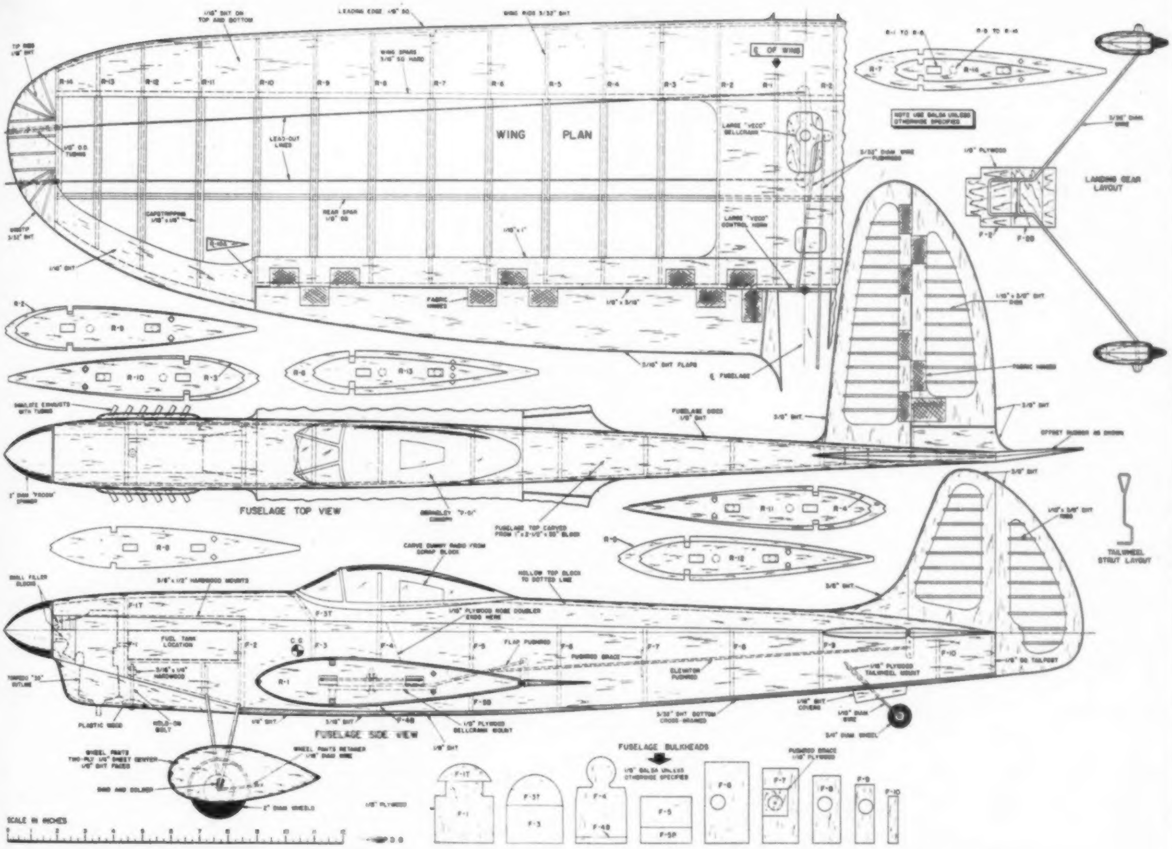
Liquid-fueled rockets by amateurs horrify real rocketeers. In fact, few amateur efforts could even approach anything like this rocket. Interestingly, 50% of hobbyists not aware of dangers.

Two 17 year olds hope to shoot a liquid oxygen-kerosene rocket to five miles.



DETAIL OF BELLCRANK ASSEMBLY

Smart paint job, slick finish, P-40 type nose, cockpit and wheel pants—cool man! Double-wire gear prevents trip-overs in landing.



FULL SIZE PLANS AVAILABLE. SEE PAGE 60

A truly beautiful stunt model with a top contest record. For .29 to .35 engines, it brilliantly tops off long development series.

by THORNTON HOFFMAN

The Conquistador

► Conquistador II is the fourth in a series of elliptical wing stunt models, the first of which was built in 1949. The original model was designed to get away from the boxy straight lines which prevailed on most stunt models of that day. The main difference between the original design and the improved versions which followed, was the wing area and the various moment arms used, and the turtledeck type cabin. The original wing span was 49", and the power was a Fox .35

The second model was a slightly larger version of the original. Construction was lightened, the wing area increased, the turtledeck removed and replaced by a bubble canopy, and the tail moment arm was shortened. Power was a Veco .29. This model placed 2nd in the open division at the 1953 Nationals.

The third model was the one built for the 1953 Nationals, but due to an error in judgment, pulled out of a dive into concrete about six feet too deep, resulting in broken motor mounts and a bent nose. This occurred during the Nationals and, unfortunately, I didn't have time to repair it, so version number two was removed from moth balls. This third model was again increased in size and wing area, and the engine was inverted and fully cowled. It was similar to final version, except for wing and rib shapes.

Conquistador II was built in 1954 to suit the new Torpedo .35, thus giving me a model which would fly equally well in calm or windy weather. It is quite fast, thus has plenty of speed to do all the maneuvers in calm air, yet is heavy enough to go through the stiffest wind without any ill effects, except an increase in speed in down wind maneuvers.

In designing this model, I tried to keep the lines as clean as possible, while improving on all of its predecessors. The finished product is a large, beautiful, but extremely rugged machine, which if handled properly, will give you years of service. My model weighs 50 oz. Don't let that alarm you, for it is capable of turning as tight, or tighter than any of the featherweights, without suffering the buffeting which they encounter. It is in its fourth season, and is none the worse for wear. It has an impressive string of wins, and maximum appearance points are the rule rather than the exception.

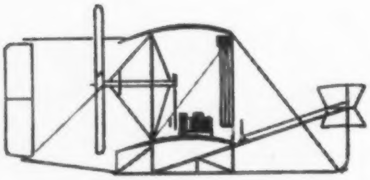
Start construction with the wing, this being the largest project. All wing ribs are cut from medium stock 3/32" sheet balsa. You will note that there are two of each rib required except #1 rib, one of which is required. Although #1 rib is the center

(*Continued on page* 43)

Early Birds

by DOUGLAS ROLFE

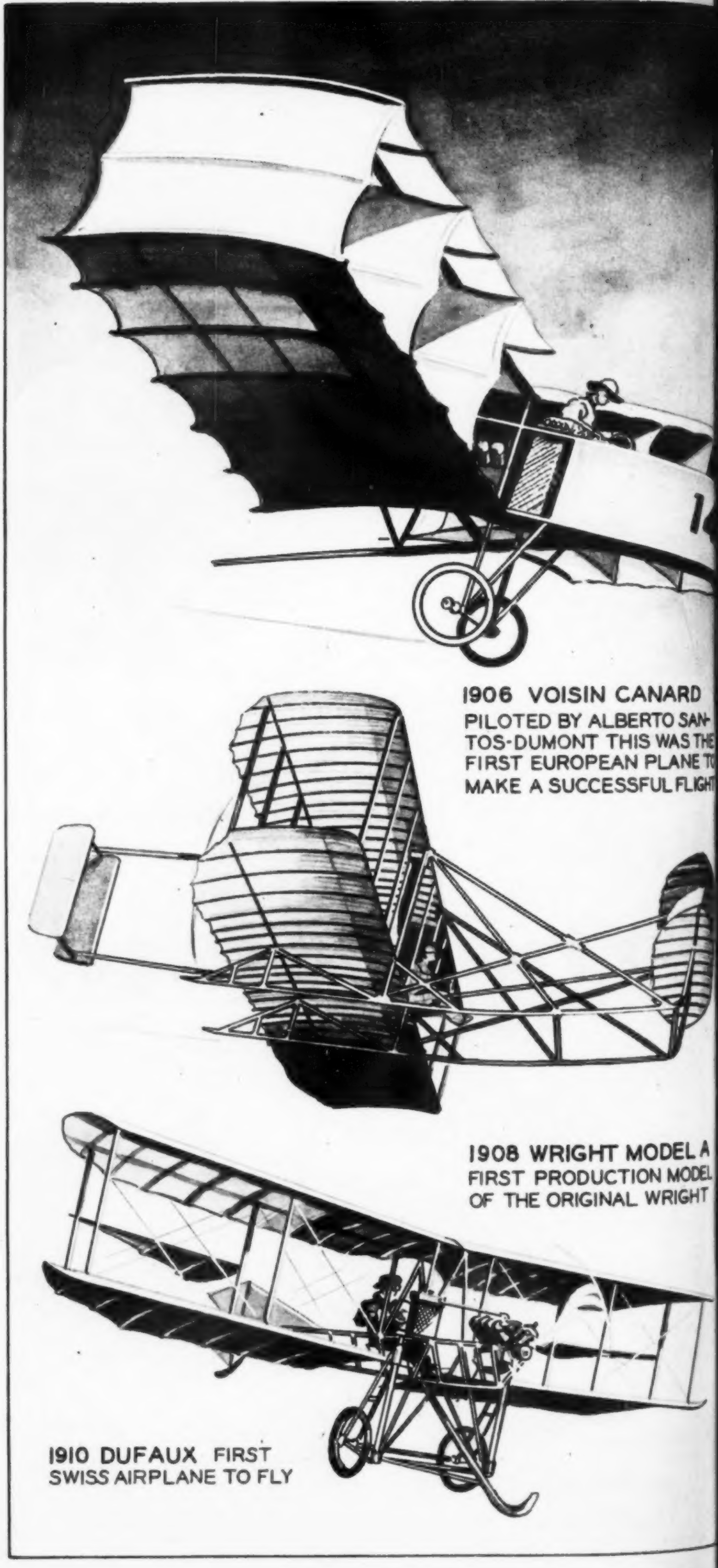
The First BIPLANES

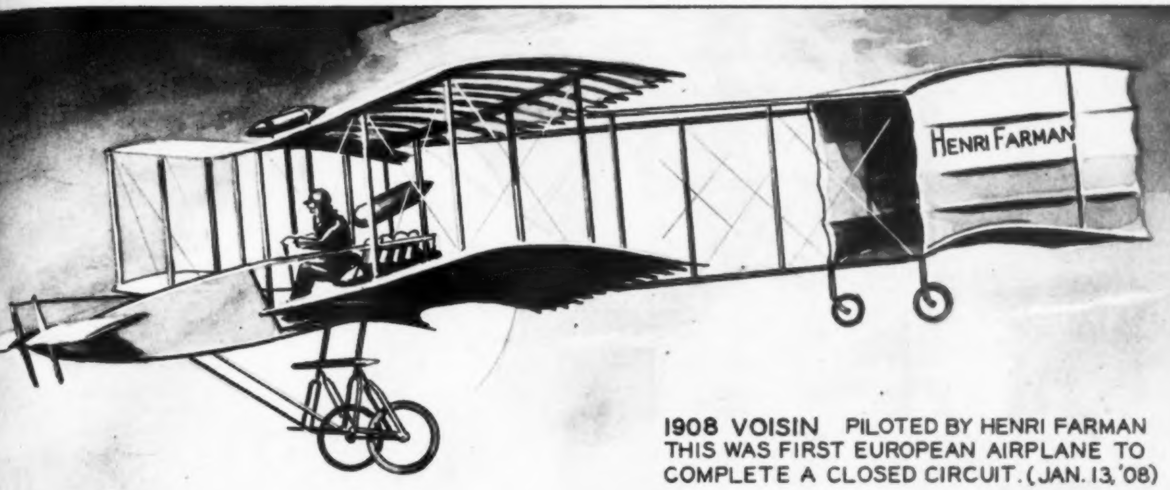


Fifty years ago flight was a formidable problem. This illustrated series will alternate with Men and Ships.

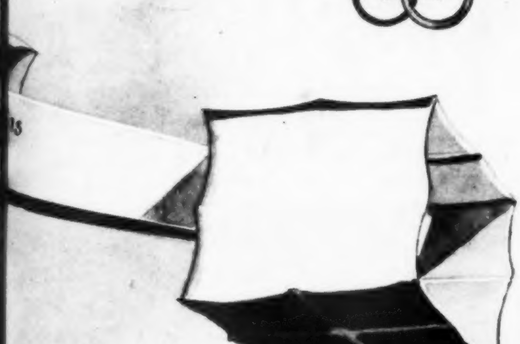
► This series starts quite properly with the biplanes of 1903-1910. Despite the fact that at least two monoplanes almost beat them to the punch, the Wright Brothers were the first to demonstrate powered flight. And the reason they were able to do so was that they were the first to solve the problems of controlled flight. From lessons learned from practical experiments with gliders they had rightly concluded that the true function of the aerial rudder was not to steer but to prevent yaw. In fact they saw far enough ahead to interconnect rudder with lateral control—not used by other aircraft again until the advent of the Ercoupe.

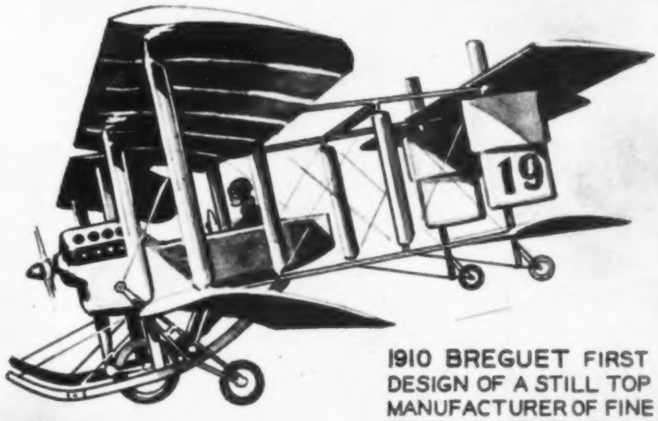
But the Wright method of operating their still excellent control system was cumbersome and difficult to master and Wilbur Wright refused to modify his truly great invention until, like Henry Ford and his similar obstinacy over the Model T (*Continued on page* 56)





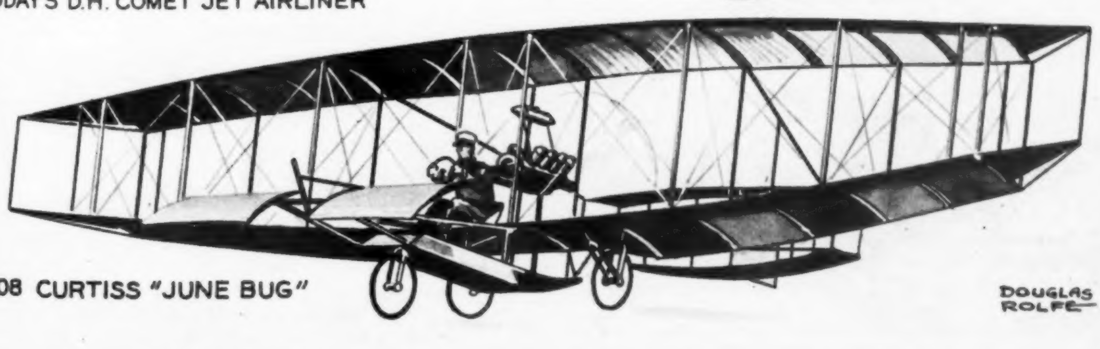
1908 VOISIN PILOTED BY HENRI FARMAN THIS WAS FIRST EUROPEAN AIRPLANE TO COMPLETE A CLOSED CIRCUIT. (JAN. 13, '08)





1910 BREGUET FIRST DESIGN OF A STILL TOP MANUFACTURER OF FINE CIVIL & MILITARY AIRCRAFT

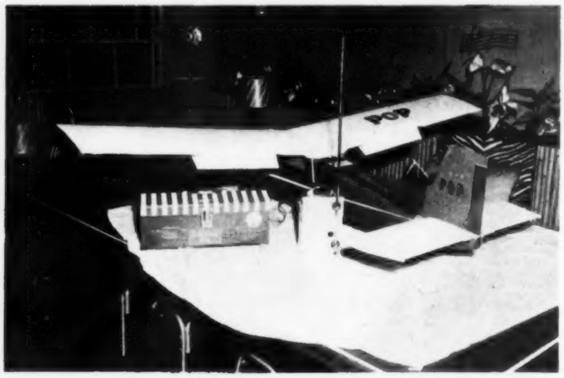
1908 DE HAVILLAND FIRST D.H. DESIGN AND DIRECT ANCESTOR OF TODAY'S D.H. COMET JET AIRLINER



1908 CURTISS "JUNE BUG"

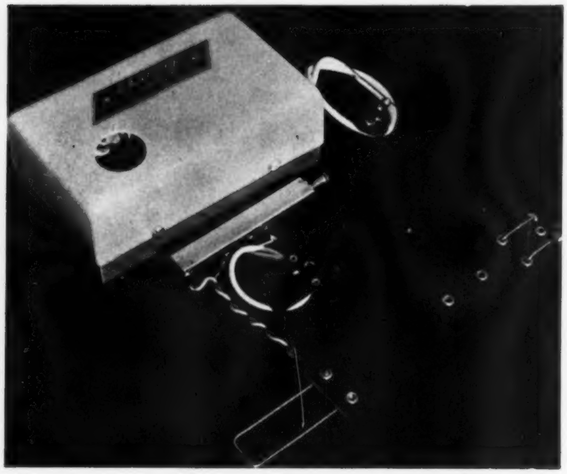
DOUGLAS ROLFE

• Monthly "Newsletter" for beginner, expert, briefs on new products, concepts, tricky ideas, out-of-this-world airplanes. How about a 48-hr. day—when do we fly?



Six-channel Bramco in Bartuska's plane. One channel drives Mighty Midget motor working Telechron clock gear mechanism for flaps.

Splendid Jungmeister scale, H. F. Sherwood, uses Fox .59 engine and Good dual-proportional RC gear. It's prewar German stunter.



Babcock's two-channel 465 repackaged in plastic case, uses 22.5v and weighs only six ounces, a reduction of four ounces in weight.

Case removed to show new layout: has improved filters (Toroids) for better selectivity, eliminates extra antenna. More sensitive.

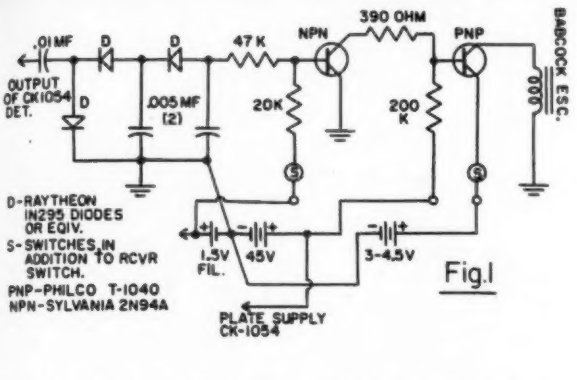
Radio Control News

by EDWARD J. LORENZ

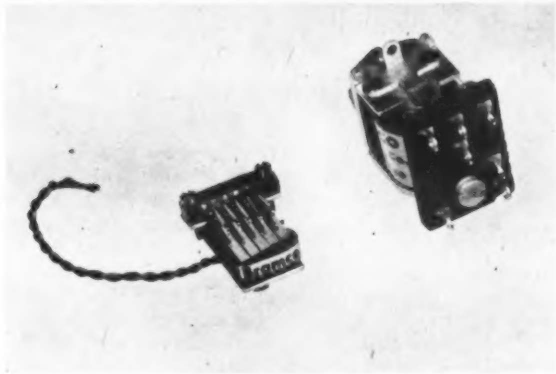
► There are many small items that should be pointed out to the beginner, and from what we have seen in the past, some of the more advanced builders could take heed.

We cannot stress too heavily the importance of making a neat installation. This can be done in many ways, starting with good sound basic ideas, good materials and a little patience. Trouble-free nylon control horns and steerable tailwheel brackets by Bonner, Bramco deBolt-servo mounting brackets are examples of hardware that can make for a neat job. Next is the wiring. Bramco, Bonner and Ace market hook-up wire, in addition to other vendors, which is color coded and of the proper size for the job. These are all stranded wires. Never use solid hook-up wire for an airborne installation, since vibration will invariably cause a failure at joints. This same type failure can also occur if stranded wire is soldered in such a way as to allow solder to flow through the strands more than about 1/16" from the connection. It is best to use a short length (about ½ to ¾ inch) of spaghetti slipped over the wire and the connection, in order to give support to the wire and prevent flexing at the connection. Above all, do not use an acid-core solder. We prefer Multi-Core 60/40 solder, #18 gauge and a 35w iron for RC work.

Since batteries are the heart of your system, use battery boxes which make good positive connections. Be sure the terminals of the holder and the batteries, or cells, are clean. Use a little sandpaper to clean them. If you must solder directly to the battery or cell, clean the surfaces with sandpaper first and then tin the wire lead. This will allow a good solder connection to be made with a minimum of heat being applied to the cell. More receiver troubles can be traced to sloppy wiring and poor solder joints than anything else. Keep wire lengths to a minimum, allow-



K. Day schematic for using relay in transistorized second stage, or to use transistor to drive actuator directly. (See June, MAN).



Invisible receiver's next! "Big" relay on right is standard Jaico Gem. On left, is the experimental Bramco sub-miniature reed bank.

ing, of course, enough length for the installation without putting a strain on the wires. Cable the wires with thread or string or use small pin staples to secure the wires. Don't allow them to flop around, since this can cause detuning. A weak point that has also been noted is the mounting of battery boxes. Secure them firmly against vibration, bouncing, etc. This is especially true for certain types of B batteries. Vibration and shock can destroy internal connections. Many an unexplained flight failure can be traced to this cause.

In addition to the receiver and plane installation, do not assume you can neglect the transmitter. Basically, each layout will depend upon the circuit used. However, here are a few tips by John Gouge of Falls Church, Va. on transmitter construction. Use disc capacitors (ceramic) for bypass capacitors and keep leads as short as possible, and to the ground. Do not allow power wires to flop around, secure them to the chassis by cable clamps or other tie downs. Maintain isolation of input and output to prevent feed through and self-oscillation. Make antenna coupling link at the B plus, or low impedance end of the final tank coil, not at the plate end. These hints will improve stability and increase output of almost any transmitter.

• • •

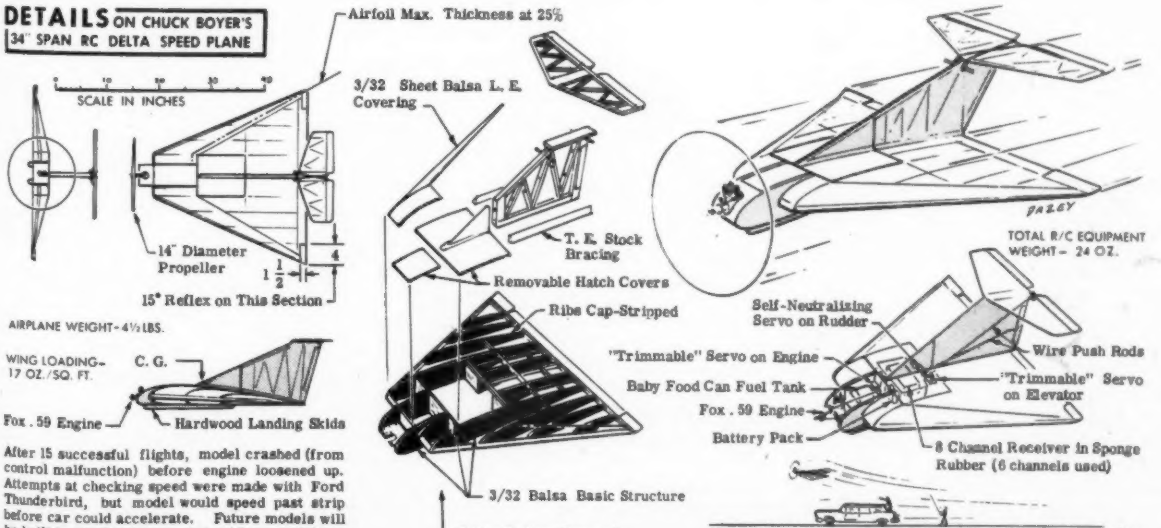
The Pioneer Radio Controllers advise, via the Modulator, that anyone having a J-3 Cub showing stalling tendencies can correct this condition by changing the wing airfoil to a Gottingen 549. Ted Rholf states that stalling tendencies both in flight and on landing are eliminated in this manner.

• • •

Fibreglased cowls and fuselage front ends becoming more popular in RC work and the Larks of California have presented the following "Hobby Tricks of R/C" at one of their meetings: Cut and fit fibreglas over desired form; mix resin according to manufacturer's recommendations; brush mixture over fibreglas with a stiff brush until cloth is saturated; cover the entire area with Saran wrap; smooth resin and mat with a flat piece of wood, working all air bubbles out towards the edges; let harden. The Saran wrap eliminates most of the usual mess.

• • •

A new circuit for the CK-1054 tube was given in June MAN. July showed a simple, second, transistor stage. In Fig. 1 we have a circuit by K. Day, Rothenberg Road, RD #2, Poughkeepsie, N.Y. which will allow a relay to be used in a transistorized second stage or the second transistor can drive an actuator directly. The relayless unit has worked well for eight months; there being no relay points to get pitted or out of adjustment. The main drawback is that the single transistor acts as the normally open contact of the relay and if the *(Continued on next page)*



After 15 successful flights, model crashed (from control malfunction) before engine loosened up. Attempts at checking speed were made with Ford Thunderbird, but model would speed past strip before car could accelerate. Future models will be built to similar layout, but with no stabilizer on fin, and single wheel L. G. will be used.

Launching method — from tail gate of station wagon speeding down abandoned airstrip. On landing model slides up to 200 ft.

normally closed point is needed, as in the case of the deBolt type servo, another transistor would have to be added. The circuit shown will work equally as well, with a Babcock escapement, on 3 or 4.5 volts.

• • •

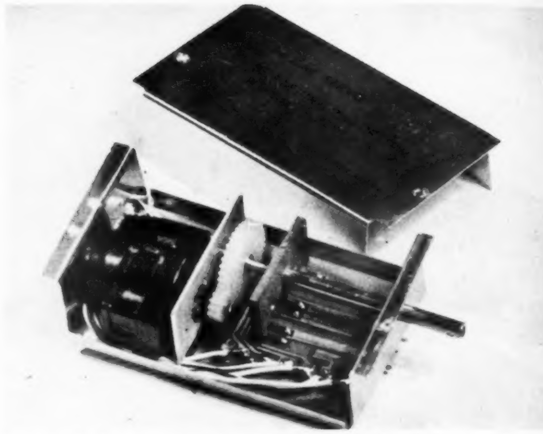
In Hungary and Czechoslovakia the RC fan is concentrating on his twin-tube receiver using two DL92 tubes. These 25ma filament, miniature tubes, are used for the conventional super-regen detector, which is transformer coupled to the second stage and having the hiss signal re-amplified through a twin-diode reflex circuit. Operating from a 45v B supply, this receiver idles at about 2ma and jumps to 11ma with signal (thru a 2,000 ohm relay). The transmitter is a simple hand-held unit, being small enough to indicate good sensitivity of the receiver.

From Sweden we noted a receiver circuit which used a DL651 tube detector transformer coupled to an OC604 transistor, which in turn was transformer coupled to the second OC604. The second OC604 was directly coupled to a third one which, in turn, drove an OC76 transistor. Tube voltage was 22.5 to 30 volts. The transistor circuitry uses 4.5v with a 30 to 50 ohm relay. Idling current is below 1ma with the relay current jumping to about 125ma with signal. Transistorized broadcast radios show ingenuity in packaging. The hobbyist can also buy kits for long-line receivers, operating down to 1 meter, or 300mc.

• • •

NEW ITEMS

To operate on other than 27.255mc, thoughts turn to obtaining a Novice, Technician's or General Amateur license. A photo shows two telegraph keys, marketed by Lafayette Radio, 165-08 Liberty Avenue, Jamaica 33, New York. The plain one sells for 79 cents and the ball-bearing,



A new slimline Servo produced by Cobb Hobby Mfg., operates on 1½ to 3v. Weight is 1.5 ounces but it delivers 1¼ pounds of thrust.

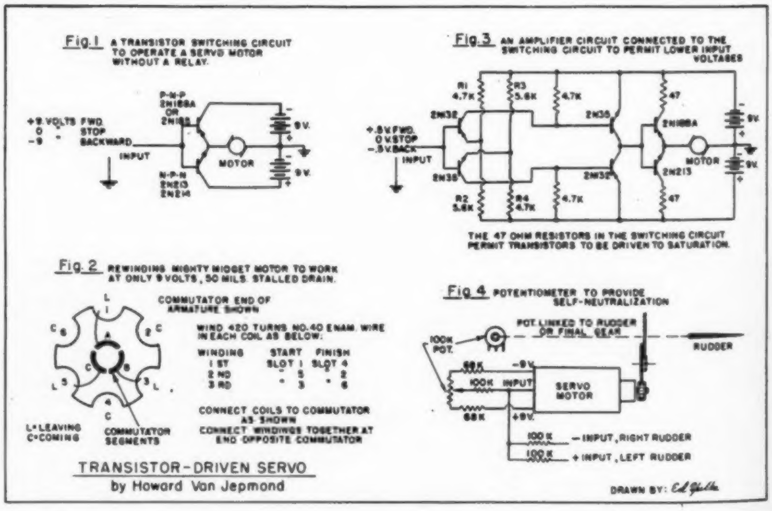
silver contact model is $1.95. A High Frequency Buzzer is also available for 99 cents. For but $1.78, plus two flashlight cells, you are in business as far as getting started on the 5 or 13 words-per-minute code speed.

• • •

In the June column there were pictures of the Vanguard receiver and transmitter as marketed by America's Hobby Center, NYC. The receiver uses two 1AG4's in the German Graupner type circuit and, once properly tuned there is no need for further adjustment. This unit operates on 22.5, 30 and 45 volts for the plate supply. 22.5v operation gives a maximum relay current of about 2.6ma at a distance of 500 feet on the ground, with a correspondingly greater change at the higher (*Continued on page* 40)

TRANSISTOR SERVO CIRCUIT

by Howard Van Jepmond



TRANSISTOR-DRIVEN SERVO
by Howard Van Jepmond

DRAWN BY: Ed Gh...

► The system shown here does away completely with relays, centering rubber bands, and the motor operates on nine volts at only 20 ma.! The stalled rating of the rewound motor is only 50 ma. Basically, the unit consists of a switching transistor stage to replace the relay and the armature of the motor is wound to match. Figure 1 shows the complementary symmetry circuit, wherein the transistors do not fight each other through forward, reverse or stopped. The transistors merely act to supply the motor with the comparatively high current it needs, but are operated by much smaller current requirements from the receiver.

Figure 2 shows how the motor armature is rewound. Remove the three windings of #34 wire (104 turns) and replace with 420 turns of #40 enameled wire on each coil as shown in the winding diagram. The diagram shows the commutator end of the armature. Each coil is to start here and finish at the "back" end away from the commutator, where they are joined together and soldered. The chart shows which commutator segment each coil end is soldered to. A touch of cement will hold the commutator and wires in place when you're finished.

Figure 3 shows a circuit that adds two more transistors to lower the voltage requirements from the receiver from nine volts as shown in Figure 1 to only .5 volt. This can be reduced still further by making R2 and R3 4.7k as well as R1 and R4, but it will be necessary to measure the actual resistance and use the slightly higher resistances in the R2 (*Continued on page* 36)

Fifteen year old Hardy Lewis, Jr. topped the Nats Junior event with a fast 90.6 mph, took the Southwestern Champs with an Orbit.

The designer, confined to his wheel chair, is one of country's top speed men. Well known fliers use his designs when chips down.

The ORBIT

by LESTER GROGAN

Nationals winning Half A speed job makes a hot project for those small engines. Monoline, a must to beat all comers.

► The Orbit Half-A is a time-tested, proved speed model design with flying characteristics of a larger class. It is built from an accumulation of data from three previous models. It is an up-to-date design for the expert as well as a stable and consistent model for the beginner.

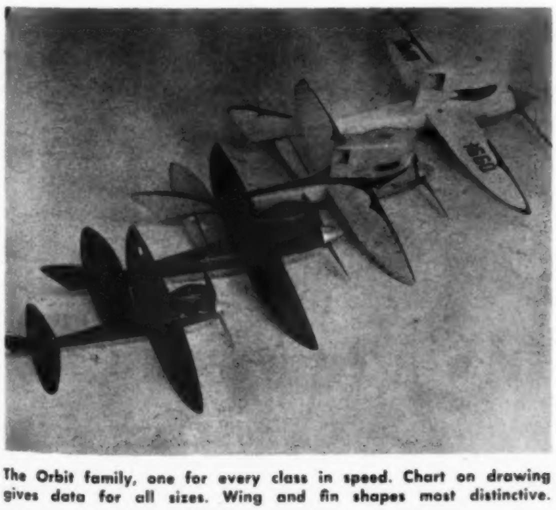
The first model I built to this design was a class C job—started a few weeks before the 1956 Nationals in Dallas. It was finished in the work hangar the day before C day. Engine trouble put us out of the running, A few months after the Nats I finally got an engine to run well enough for Leland Morton to fly the Orbit C over 165 mph about 12 times. Being confined to a wheel chair as I am, Leland flies all my models by proxy. We fly as a team, using the Orbit design in all classes.

First model built after forming a team was an Orbit A which took us about three weeks spare time. It turned 137 mph on the first flight. At its first contest, the Longview Model Airplane Championships, it placed second with a speed of 134 mph. The second contest was the Houston Internationals. Here we took first with a speed of 136 mph. The third contest, the Southwestern Model Airplane Championships in Dallas saw the Orbit place first with a speed of 139.95 mph. The Orbit A is powered with a K&B .19 but a Fox .19 could be used.

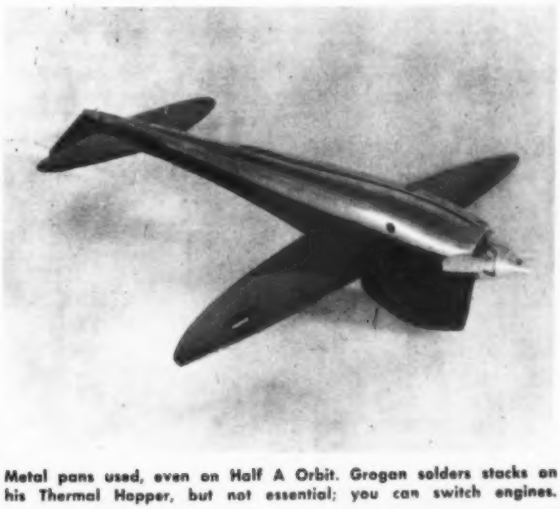
After we finished the A, we began an Orbit B and finished it in the same amount of time required for the A. The first contest we flew the B in was Longview, but we had engine trouble and didn't get an official time. We did make an unofficial flight of 144 mph in the rain which would have won first place. At Houston the Orbit B placed first with a speed of 142. Also in the rain. We didn't place in B at the Southwesterns because of a broken fuel line. In the few weeks after the Southwesterns we turned several flights over 145 mph.

Leland was unable to go to the '57 Nationals at Willow Grove, Pa., but I made the trip. Dale Kirn and Ed Rankin flew my models for me there. It was about three weeks before the Nationals when I found out that Leland was unable to go. There was only two weeks left when I decided to

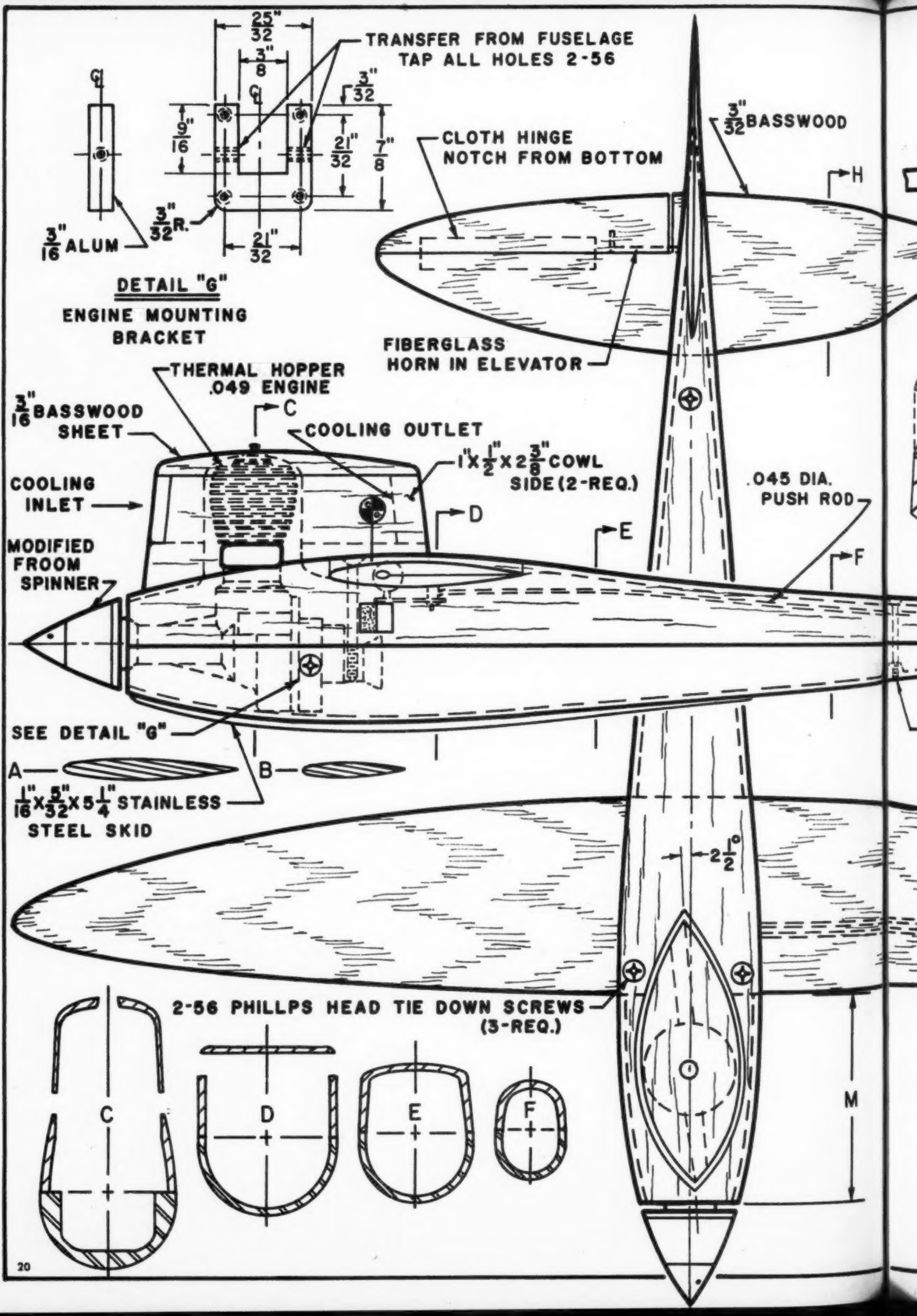
(*Continued on page* 52) PLANS NEXT TWO PAGES



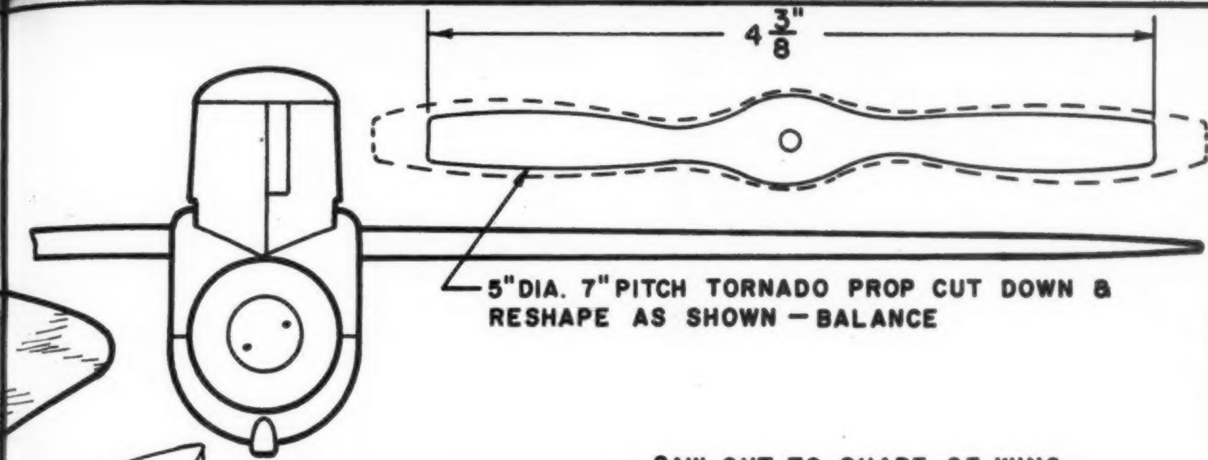
The Orbit family, one for every class in speed. Chart on drawing gives data for all sizes. Wing and fin shapes most distinctive.

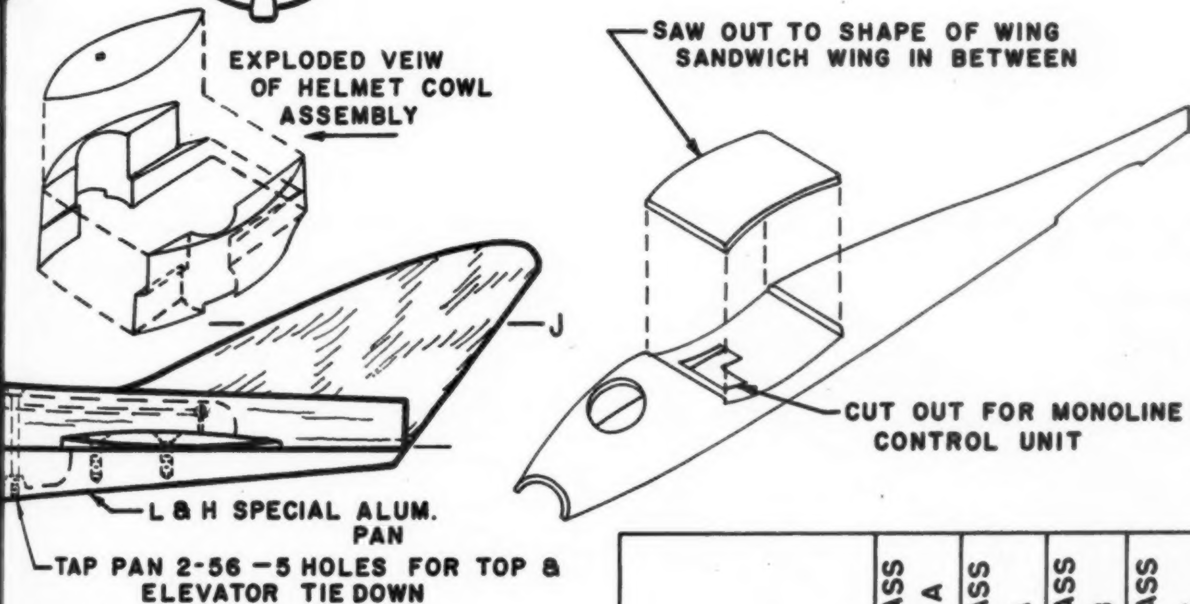


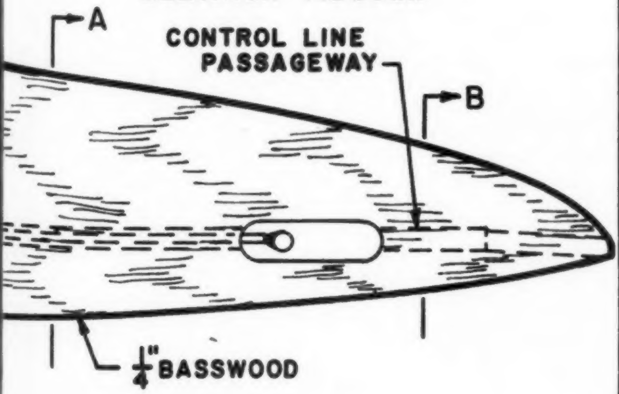
Metal pans used, even on Half A Orbit. Grogan solders stacks on his Thermal Hopper, but not essential; you can switch engines.



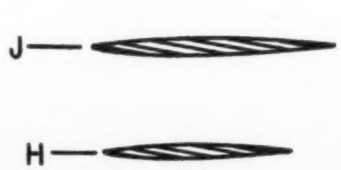
TRANSFER FROM FUSELAGE
TAP ALL HOLES 2-56
25"/32
3"/8
3"/32
9"/16
21"/32
7"/8
3"/32 R.
21"/32
3"/16 ALUM
DETAIL "G"
ENGINE MOUNTING
BRACKET
3"/32 BASSWOOD
CLOTH HINGE
NOTCH FROM BOTTOM
H
FIBERGLASS
HORN IN ELEVATOR
THERMAL HOPPER
.049 ENGINE
3"/16 BASSWOOD
SHEET
C
COOLING OUTLET
1" X 1/2" X 2 3/8" COWL
SIDE (2-REQ.)
COOLING
INLET
D
E
.045 DIA.
PUSH ROD
MODIFIED
FROOM
SPINNER
F
SEE DETAIL "G"
A
B
1/16" X 5/32" X 5 1/4" STAINLESS
STEEL SKID
2 1/2°
2-56 PHILLPS HEAD TIE DOWN SCREWS
(3-REQ.)
C
D
E
F
M



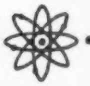




USE PEN BLADDER TANK

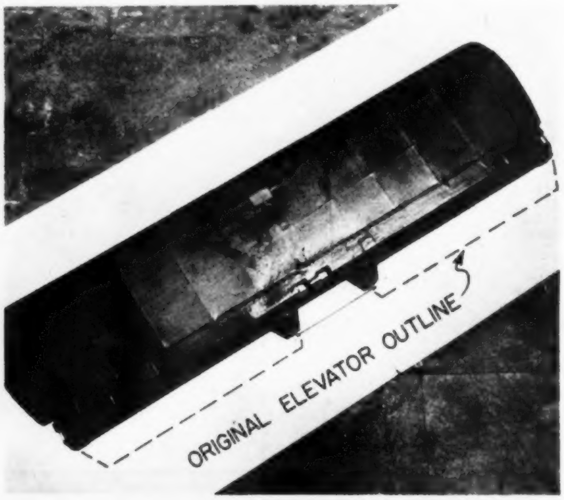


	CLASS $\frac{1}{2}$ A	CLASS A	CLASS B	CLASS C
WING SPAN	$11\frac{1}{4}$"	$14\frac{3}{8}$"	$16\frac{1}{2}$"	20"
ROOT CHORD	$1\frac{5}{8}$"	$1\frac{7}{8}$"	$2\frac{1}{4}$"	$2\frac{1}{2}$"
LENGTH	$9\frac{1}{16}$"	$12\frac{5}{16}$"	$13\frac{3}{4}$"	16"
WING AREA (SQ.")	13"	24"	30"	38"
ELEVATOR AREA (SQ.")	$5\frac{3}{4}$"	$9\frac{1}{2}$"	$14\frac{1}{2}$"	16"
RUDDER AREA (SQ.")	$1\frac{1}{4}$"	$4\frac{1}{2}$"	6"	$10\frac{1}{4}$"
"M" DIM.	$1\frac{11}{16}$"	$2\frac{9}{16}$"	$2\frac{7}{8}$"	$3\frac{5}{16}$"

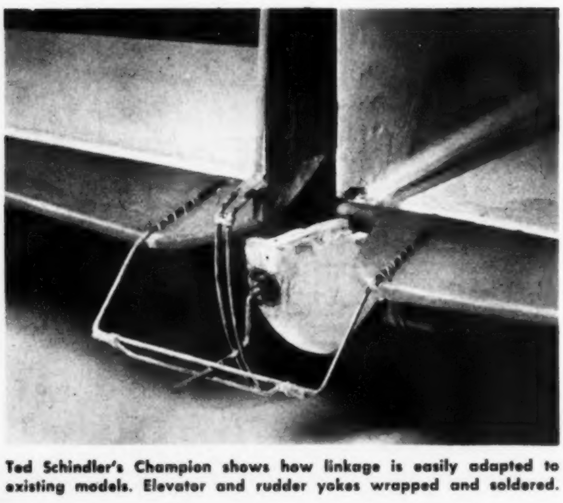
OR--BIT

DESIGNED BY LESTER GROGAN — DRAWN BY LELAND MORTON

"Toothpick" elevator on Don Brown's Esquire. Ship flew inverted, topped pylon racers, best single-channel Langley round-up, '57.

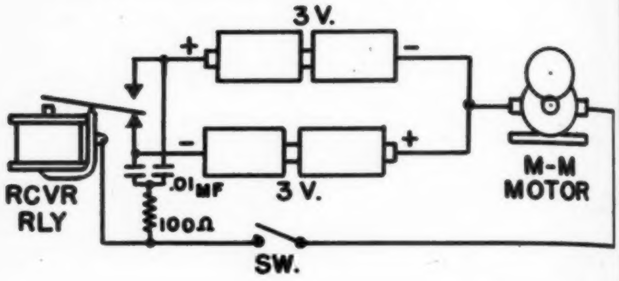


Modified stab, elevator, author's Cruiser, gave more control by ⅝" wide flipper. Counterweights on tips relieve actuator load.



Ted Schindler's Champion shows how linkage is easily adapted to existing models. Elevator and rudder yokes wrapped and soldered.

Basic S/S Wiring Fig. 1



SIMPL-SIMUL

PART TWO

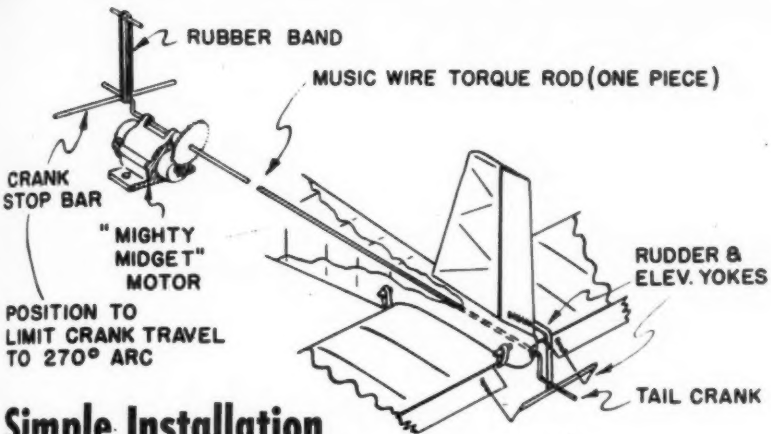
The mostest for the leastest, dual-simultaneous control system is easily installed in existing models. Prove it? That's a cinch!

by JOHN WORTH

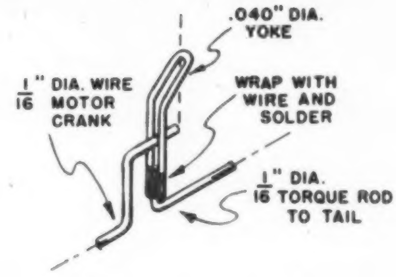
► It was briefly explained in the preceding article that the Simpl/Simul control system provides simultaneous proportional control of both rudder and elevator by means of an uncomplicated model installation. The simple wiring diagram (Fig. 1) shows that only one actuator and two sets of batteries are used; controlled by a standard single channel receiver/relay combination. This is not a deliberately oversimplified schematic—that's all there is to it! When switched by pulsed transmitter signals of varied rates and widths, the relay alternately reverses polarity of current through the actuator, causing it to oscillate in various patterns which are related proportionally to the signals. Simple torque-rod linkage transfers the oscillations to rudder and elevator yokes which continuously flap the control surfaces about average positions corresponding to the signals. Natural damping of the model then irons out the action and the flight path is smooth despite the fluttering tail surfaces. The model responds instantly to an unrestricted control stick and flying calls for real piloting. With controls that can be mixed and coordinated as desired, the S/S puts you in command all the way, unhampered by control sequence lags or one-at-a-time control availability. That's the pitch and here's the know-how to get you into the act:

MODEL DETAILS

Suitable Designs: The S/S has been flown in a dozen different models, ranging from an .09-powered Breezy Jr. to a .35-powered Live Wire Cruiser. All have been fine performers. If there is an optimum size, it probably is represented by the .15 glow-powered Esquire or the .15 diesel-powered deBolt Champion. For any size model, best performance is obtained with a wing loading below 16 oz. per sq. foot, though up to 20 oz. is acceptable if provided with ample engine power. High wing loading, however, produces a fast flying "bomb" that requires considerable piloting skill to fly. Low wing loading eases the learning period and also provides spectacular performance, including inverted flight which is otherwise practically impossible to achieve.



Simple Installation
Fig. 2



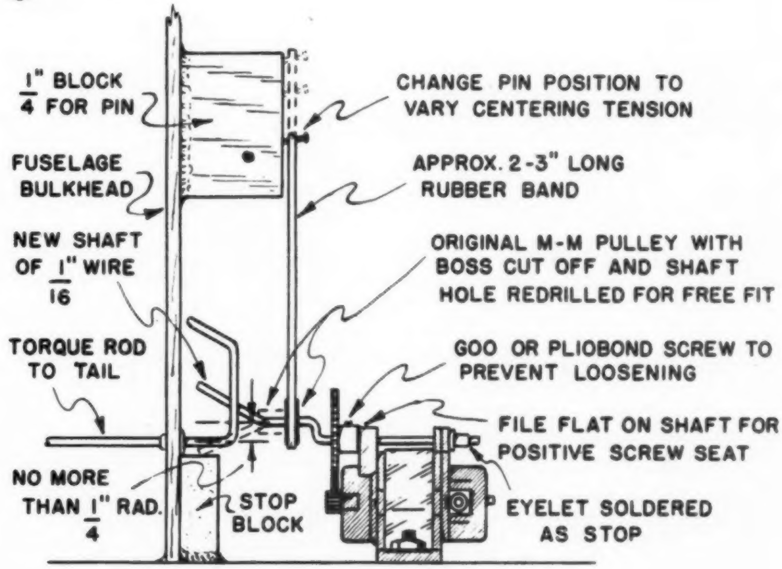
Actuator Coupling
Fig. 3

Basic Installation: Most models can be quickly equipped for S/S with the simple arrangement shown in Fig. 2. The original shaft for the large gear on a Mighty Midget motor is removed and a length of 1/16" music wire is substituted. One short radius crank is provided at the motor and a larger one at the tail of the model. In between, the shaft is perfectly straight, being supported only by the motor, a bearing at the tail end and, if necessary, loose-fitting guides along the length to hold down whipping of the shaft. To prevent binding and alignment problems no other bearings are used. A rubber band hooked over the crank at the motor provides centering tension, and a bar placed across the crank travel arc limits total crank rotation to about 270 degrees. Fig. 4 illustrates details of a more developed actuator installation, featuring several recommended refinements, but the simpler Fig. 2 set-up performs just as good.

Linkage Disconnect: Many fliers prefer a coupling link which permits simple disconnection of the motor for inspection or maintenance. One such coupling is shown (Fig. 3); adaptable to most models and particularly to the very popular receiver/battery/actuator packages typical of the deBolt-type models. With this type of coupling, the package is simply slid in or out of the model, with automatic linkage engagement or release. Torque rod centerline should coincide with that of the actuator gear, though up to about 1/16" horizontal misalignment (side view) may be acceptable. Lateral alignment (as seen from above or below) should be exact.

Centering Tension: The rubber band has proved to be completely satisfactory, with hundreds of flights made among a number of models without a case of breakage. If a band does break, air loads in flight provide enough centering action to maintain control. Hold-

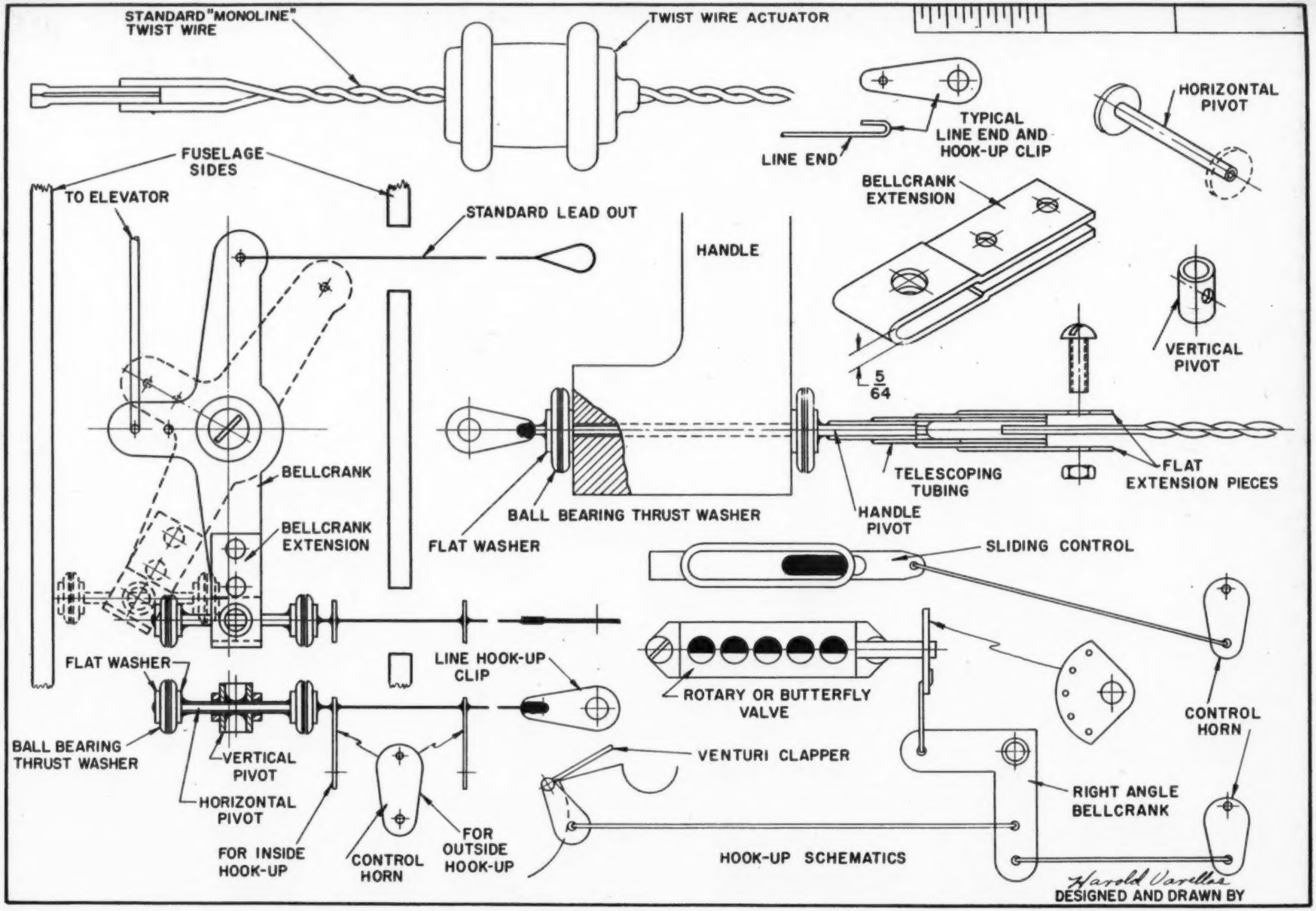
(*Continued on page* 46)



Typical Actuator Installation
Fig. 4

"Champion" Tail Linkage
Fig. 5

NOTE: FULL DOWN ELEV. WITH CRANK IN NEUTRAL; UP ELEV. (DASHED LINES) WITH CRANK 135° FROM NEUT. (REAR VIEW)


STANDARD "MONOLINE" TWIST WIRE
TWIST WIRE ACTUATOR
TYPICAL LINE END AND HOOK-UP CLIP
LINE END
HORIZONTAL PIVOT
FUSELAGE SIDES
TO ELEVATOR
STANDARD LEAD OUT
HANDLE
BELLCRANK EXTENSION
VERTICAL PIVOT
5/64
BELLCRANK
BELLCRANK EXTENSION
TELESCOPING TUBING
FLAT EXTENSION PIECES
BALL BEARING THRUST WASHER
HANDLE PIVOT
FLAT WASHER
SLIDING CONTROL
FLAT WASHER
LINE HOOK-UP CLIP
ROTARY OR BUTTERFLY VALVE
CONTROL HORN
BALL BEARING THRUST WASHER
VERTICAL PIVOT
VENTURI CLAPPER
HORIZONTAL PIVOT
RIGHT ANGLE BELLCRANK
FOR INSIDE HOOK-UP
CONTROL HORN
FOR OUTSIDE HOOK-UP
HOOK-UP SCHEMATICS
Harold Varellas
DESIGNED AND DRAWN BY

EXIT.. The Third Line!

by HAROLD VARELLAS

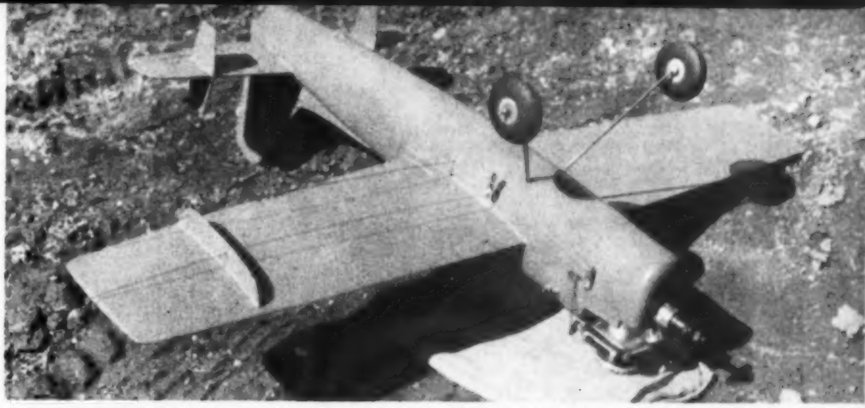
Throttle control without third-line drag, or excess pull on airplane, results from combo of UC, Mono-Line.

► One of the fastest growing control line events is Navy Carrier as indicated by the '57 Nationals when the event was extended to two days to accommodate the large entry. (Navy Carrier is an event which takes practice but is an event anyone can enter very soon after learning to fly level; because there are usually three age groups, you can compete in your own age group.)

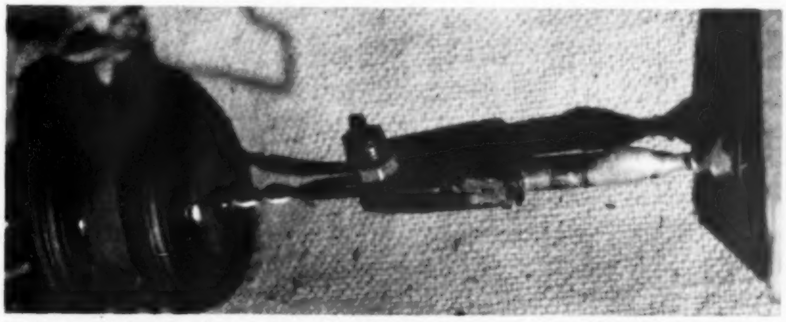
To date the principle means of throttle control has been a third line. For third line control you have to provide a spring return on the throttle-control lever arm. This spring has to be strong enough to offset the third-line drag or else the drag will operate the throttle. A spring this strong requires a strong pull to operate the throttle and may tend to pull the plane in when you operate the third line.

In speed it is an established fact that Mono-Line gives added miles per hour over conventional two-line systems because it cuts line drag in half. If in Navy Carrier the third line could be eliminated, it stands to reason that miles per hour can be added to the high speed run (high speed is what gets you the points) and at the same time eliminate the possibility of line drag being strong enough to actuate the throttle accidentally.

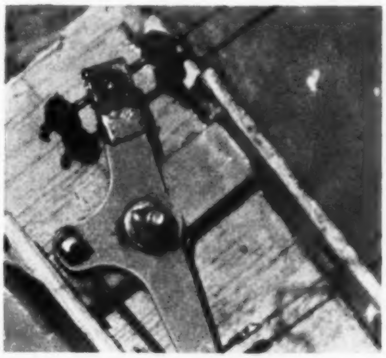
For the past three years I have used a method I devised for elimination of the troublesome third line. I have flown in all local meets which have the carrier event and at the '56 Nationals in Dallas and the '57 Nationals at Willow Grove. The fact I did not come out a winner was not the fault of the throttle control. Everytime I have flown my Navy Carrier the throttle control operated perfectly. *(Continued on page* 58)



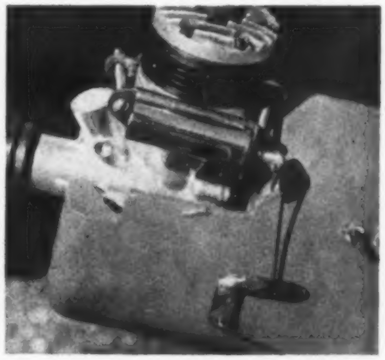
Author flies Domizi Nats-winning Guardian (No. 14), Feb. '55 MAN. Notice throttle bellcrank.



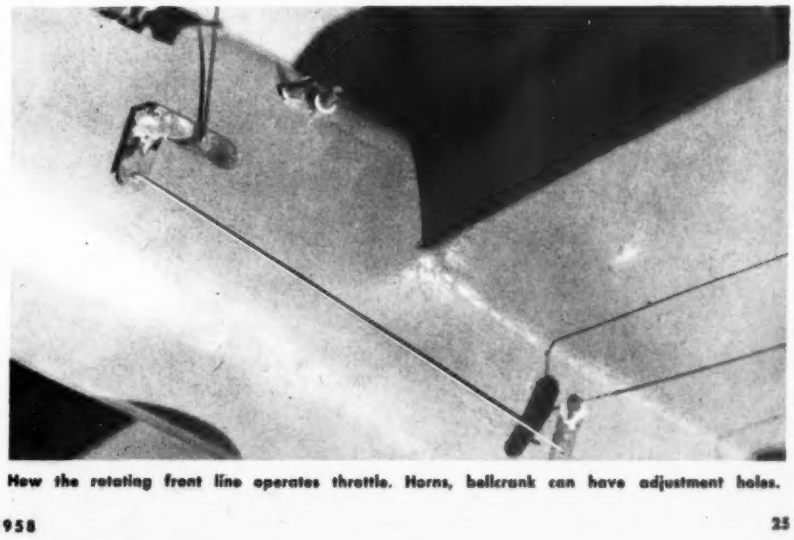
At the control handle, showing how Mono-Line twist wire, pivot, installed. See the drawing.



Plane control is usual two-line U-control set-up, but front line can be rotated also.



Roto-Valve exhaust throttle set up on K & B engine. Linkage should interest the RC men.



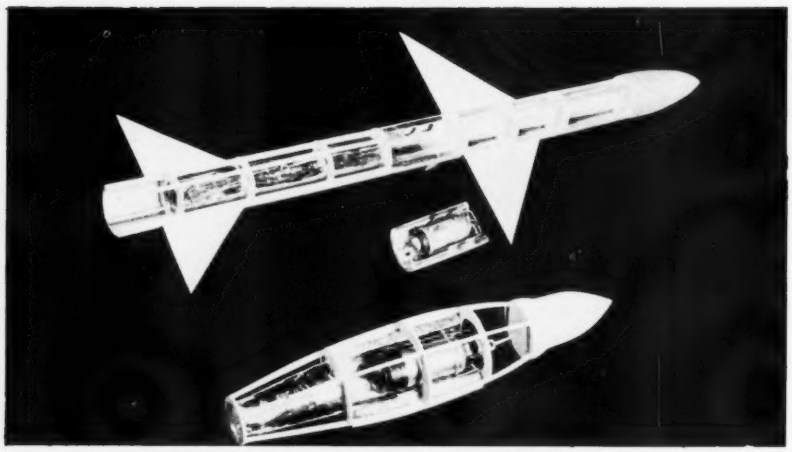
How the rotating front line operates throttle. Horns, bellcrank can have adjustment holes.

TWO STAGE ROCKET

by PAUL E. DEL GATTO

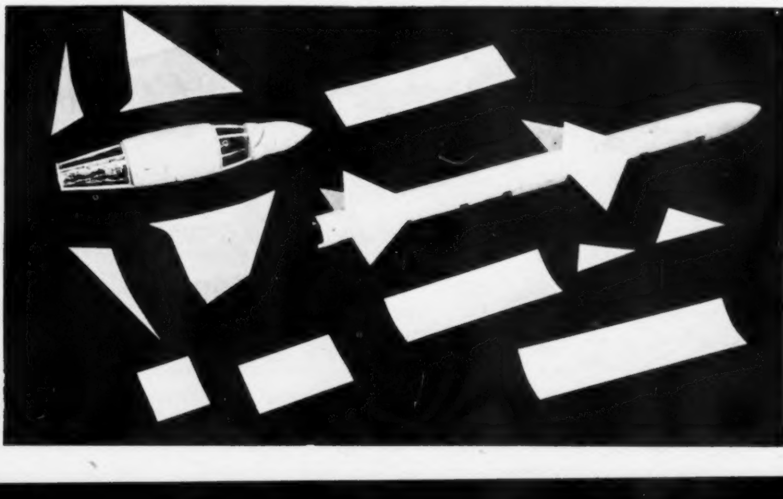
Shown in color on the cover, Jetex-powered missile makes a highly unusual "space age" project. Works!

The two stages completed, right, total weight, engines included, should not exceed 3¼ ounces. Uses PAA-Loader 150, and 50B.



Primary framework both "hulls," light, strong. Aluminum foil proved too thin—sheet metal should be .005 in. thick to avoid burn-through. Stage-two fuse, 12-15 secs. after launch.

Sheet balsa parts easily cut out, fitted. Should time-fuse not burn second stage release rubber band, hot exhaust of stage two motor will do so. Stages should drop apart easily—work carefully.



► This two-stage missile was born over four years ago, but it was not until early April that a phone call from MAN put this space-age project into stepped-up development.

At the beginning we had to rely heavily on notes and sketches to evolve basic proportions. Jetex we knew, could be used in complete safety, so the design should utilize two Jetex engines, the "PAA-Loader 150" for stage one and the smaller "50B" for stage two. The structural requirements were determined by the limited power at our disposal. It was imperative that the missile be light in weight.

All-up weight, ready for firing, should not exceed 3¼ ounces. Since the total weight of the two engines loaded and ready to fire was 1¾ ounces, it meant that the combined weight of the two stages could not exceed 1½ ounces! If this seemed an insurmountable task, it proved less of a problem than some of the others that were encountered.

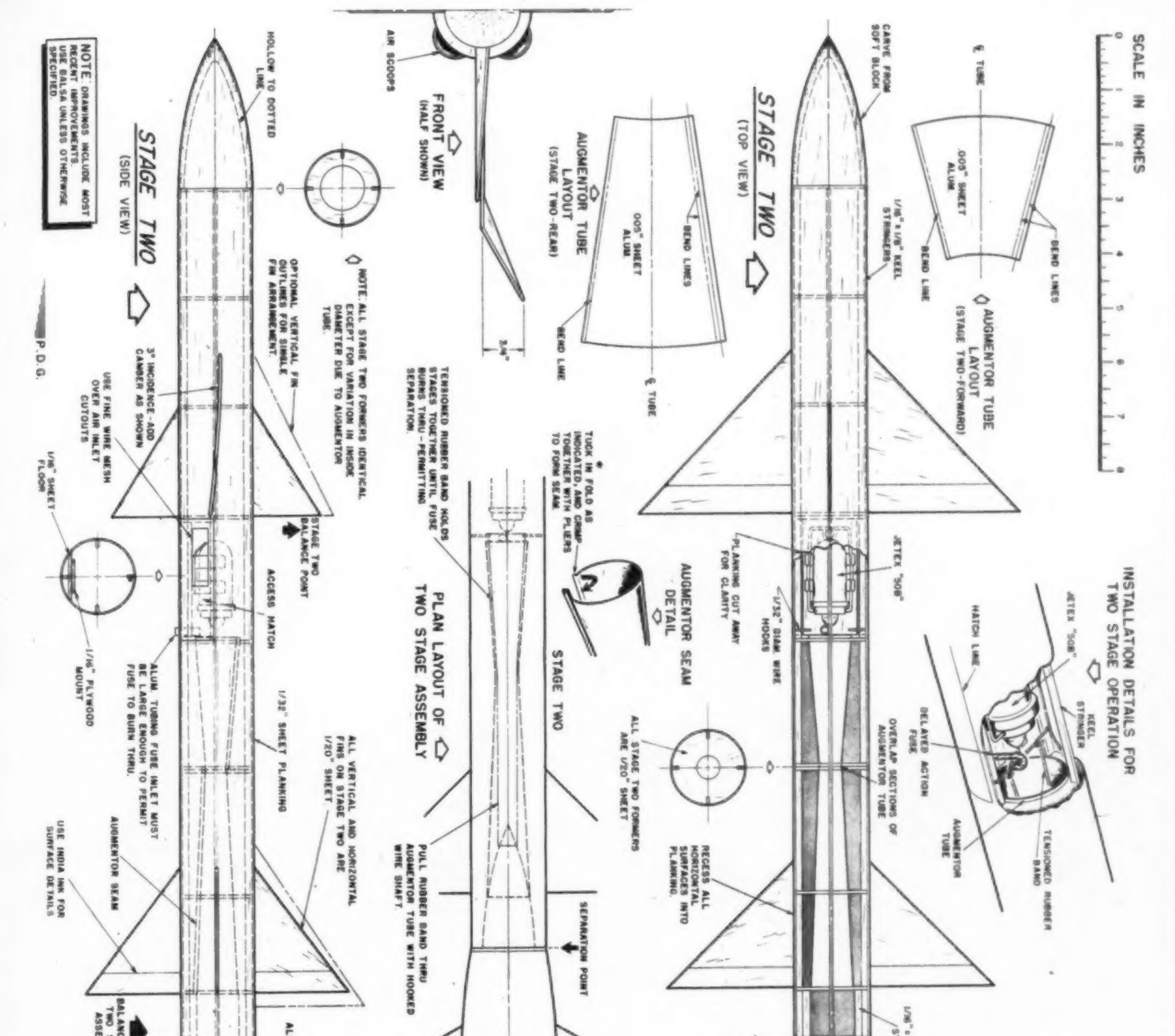
Several test mock-up designs of the configurations in profile form were made in order to evaluate stability problems which might arise later in the prototype. This proved wise from both an aerodynamic and operational point of view.

The profile configurations for both stages were tested independently, at first, to work out individual aerodynamic qualities so that each could be retrieved after a two stage flight with reasonable assurance they would not be smashed.

Stage two proved to be less troublesome than stage one, and the aerodynamic problems were licked with the testing of a second profile configuration. However, with stage one, three different profile configurations were tested before stability was satisfactory after being separated from stage two.

Now the stages were joined permanently to test the aerodynamic qualities of the complete missile and also to test the power transition from stage one to stage two. The latter test was essential to find the best timing for the change-over in two-stage operation.

After minor modifications we were able to fly the combined two-stage profile missile on the power of a "PAA-Loader 150" alone. The details for a successful (*Continued on page* 34)



FULL SIZE PLANS AVAILABLE. SEE PAGE 60

INSTITUTE OF MAKERS OF EXPLOSIVES

Amateur Rocketry

The manufacturers of rocket propellant fuels and their ingredients have learned through years of experience that elaborate safety precautions and constant vigilance are needed in the handling of these materials. Unless these materials are handled with great care using equipment and facilities with proven safety features, people will get hurt; and for that reason safety precautions have been incorporated in the manufacturing and testing processes.

In this country two general types of rocket fuels are in use—liquid and solid. Most of these are dangerous to handle, involving explosive hazards and other dangers. A single splash of fuming nitric acid, for instance, can result in lifelong disfigurement from a deep, painful, slow-healing wound; and even the fumes, if inhaled, can damage the lungs and cause death.

Most amateur rocketeers, however, are more interested in solid fuels, probably because these are more easily handled and many of the ingredients are readily available. Their potential danger, however, is just as great as the liquid fuels. Chlorates, perchlorates, picrates, fulminates, and iodates, all of which are high explosives, as well as blasting caps, black powder, and the dusts of metals, such as zinc or magnesium, are either so sensitive or unstable by themselves, or in admixture with other materials, that they are extremely dangerous to handle—much less attempt to use in a rocket engine. Their attempted compounding or use is quite likely to result in detonation or flash fires with the strong likelihood of serious injury to anyone nearby and destruction of property if handled or stored indoors.

Mixing and grinding operations of some of these materials are so dangerous that they are customarily carried out behind barricades for the protection of the operator who conducts the process by remote control. Even in laboratories where smaller quantities are compounded, the operator works behind sheets of safety glass or steel plates and, in addition, may be required to wear special fire-proof uniforms, goggles, or masks. Automatic sprinklers are used to quench fires quickly; and, in general, the people handling these materials stay at safe distances or keep themselves protected by barricades so far as possible at all times.

It should be remembered that anyone working with 10 pounds of rocket propellant has the equivalent in power of 10 pounds of dynamite. If this detonates in a rocket engine, it can throw pieces of metal for hundreds of feet, fragments that will fly off with the speeds of rifle bullets, and which can blind, cripple, or kill anyone within a range of 200 to 300 feet.

The engineers and chemists who have worked with rocket fuels and their ingredients have learned through experience, some of it experience in which people have been hurt, that it is absolutely foolhardy to take an unnecessary risk with these fuels. In particular, any new formula on which the operators have no test data is handled from start to finish, from compounding to firing, with the most thorough precautions for safety. Any other course means exposing yourself, and perhaps others, to great danger.

The manufacturers of these fuels earnestly recommend that until amateur rocketeers can work in close association with someone thoroughly experienced in handling fuels, they should confine activities to the less hazardous phases of the subject, such as the aero dynamics, guidance, tracking, and propulsion theory of rockets.

How Safe Are Rockets?

(*Continued from page* 10)

into prohibiting legislation.

"The breakdown is about even between those who realize they are experimenting with something dangerous, and those who do not," stated the Army. "Virtually no one is concerned about where his rocket might land when it comes down, or what it might hit. They are concerned only with getting it up.

"There is a corresponding lack of awareness of the potential danger in a misfire or an erratic trajectory. Many, unable to obtain chemical fuels, experiment with matchheads for fuel—these are surprisingly powerful and probably as dangerous as many other propellants.

"There is a sense of determination," continues the Army, "which indicates most young rocket enthusiasts will continue to fire rockets whether or not anyone provides a safe place for them to do it.

"Very few groups have received any type of sponsorship (that is high school science class project) or adult supervision of any kind. Most seem to be operating without anyone's knowledge."

Now it should be clearly understood what constitutes a rocket in the opinion of these thousands of would-be space men. Shown samples of rockets and devices offered in the model hobby field, officials compared even the mixed-powder types with fourth of July cannons. To be sure, one can injure himself with a play canon. But these fellows mean rockets that may go a mile high at terrific speeds.

While the average altitude attained by 535 case studies in this eight-state area was only 200 feet, actual altitudes varied from 30 feet to 1,500 feet. (You need CAA permission to fire anything above 500 feet and, also by law, permission from local authorities, police, fire department, etc. and many communities have prohibiting laws to launch any rocket.) The rockets varied from 3 inches in length to 3½ feet—the average about 12 to 18 inches long. A few were even bigger. One in Groton, Mass., measured 14 feet, another in Palisades Park, N.J., 12 feet. Lengths of 5 to 6 feet numbered 100.

How old are these rocketeers? Most are in the 14-16 year old bracket. Few are as old as 18 or 19. A large grouping averages 11-13 years. Some groups include girls. Most are quite seriously intent on their work. They are interested in furthering studies in other fields.

All amateur rocketeers are not scatter-brained kids. In a week-long series of articles, the New York World Telegram came up with such noteworthy examples as a group of six Bronx boys, ages 15 to 19, who were building a 17-foot rocket designed to reach 100 miles altitude at a speed of 2,000 mph! It will carry a full payload of instruments to measure temperatures, cosmic rays, meteorites, engine performance and will be powered by professional fuel. This junior Vanguard will be taken to Canaveral or the western desert. All these boys have won prizes in separate fields of physics, medicine, chemistry, radio and physics. One has logged 250 small rocket firings.

Rockets cost money. Plenty of it. A Flushing, N.Y. lad, whose rocket graced the stage by the speakers rostrum at a recent Rocket Symposium attended by upwards of 600 youths in the First Army area, is a three stager that cost $500. This is for one shot! It probably will be fired from Canaveral or some southwestern rocket site. Many spectacular "shoots" by

(*Continued on page* 30)

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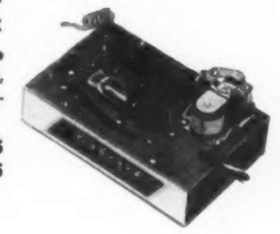

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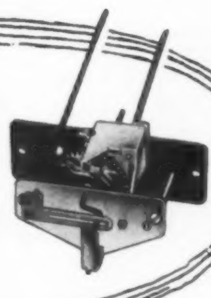

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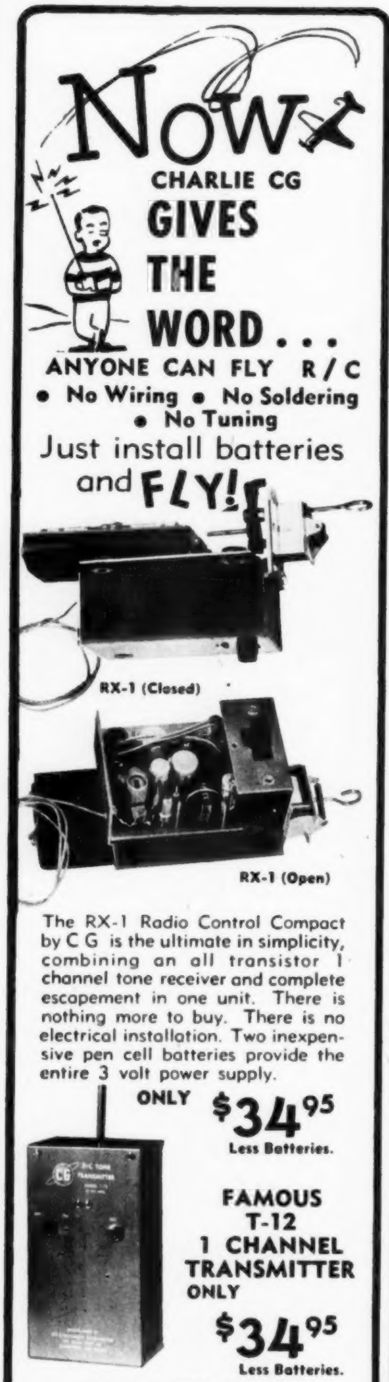

older enthusiasts, working in organized, scientific groups in high schools, even colleges have been reported from other parts of the country.

Danger is taken perhaps a bit lightly. One lad PSed a letter to the Army, "Two of our rockets exploded." Or take this one: "Our launching date is March 7, at 7:32 pm (This is the date last year when the vice president of our club blew off his left thumb with a bomb we composed.) "Our club will gladly accept any technical and safety advice as well as constructive criticism."

Unless too many eager, unguided kids, operating outside the fold, give the amateur rocketry a pair of black eyes, rocketry will grow. Public endorsement of kids who display a scientific bent amazes the model airplane people who, in fifty years of modeling, have seldom enjoyed any support. Boys who fly their "noisy" planes are banned from public parks as pests, one notch higher than delinquents, but kids who dabble in explosives get their pictures in the local paper, usually over a caption kidding those "scientists" at Canaveral. Given enough such kids, someone goes to the Borough Council, as happened in Fair Lawn, N.J., and, presto, the town sets up an official program, even obtains a rider on its insurance. A flying site is set aside. This is good, make no mistake. But the fulfilment of this movement is a race against time. Can the amateur rocketry be controlled and guided? Can enough programs be set up to satisfy the hundreds of thousands of kids who could become interested?

In the opinion of the U.S. Office of Education, students should not experiment with rockets and other missiles unless such activity is rigidly controlled and expertly supervised, as are experiments by rocket scientists and engineers.

"Young people's interest in rocketry and other scientific fields definitely should be encouraged," states Lawrence G. Derthick, U.S. Commissioner of Education. "However, recent serious accidents involving persons experimenting with rockets emphasizes the need for strict precautions."

Many young persons sometimes attempt fuel combinations and firing methods which could be dangerous even if attempted by professional rocket experts. Calculated risks inevitably are necessary to scientific progress but these risks, reduced to a minimum, should be assumed by trained adult scientists and not by high school students. Willis Brown, Office of Education, Specialist for Aviation Education, puts it this way, "Under no circumstances should a youth build a rocket, mix fuel, load a rocket, or attempt to launch it without supervision by an adult *rocket* expert. Nor should the youth work alone with fuel in a home work shop or school laboratory."

Without officially sponsored programs, amateur rocketry on a popular, safe basis may never get off the ground. The launching of rockets is illegal in most communities. The unauthorized possession, transportation and storage or use of chemical substances (liquid or solid) which in themselves, or in combination are potentially explosive, is a violation of law. Offenders are liable to fine or imprisonment eventhough no accident occurs. No one, state all qualified authorities, should handle such ingredients, who is not thoroughly familiar with their properties. No one should compound new and different types of propellants. Above all, do not experiment with finely divided metals or powdered magnesium, especially where flames and sparks may occur. Matches, cigarettes, bunsen burners, hot water heaters, furnaces, etc., are among the obvious causes of accidents. The handler must know all about ignition and flash temperatures and be able to accurately check temperatures of mixtures.

Whether the object is a rocket or a bomb depends on a complicated balance of factors in the design of container and fuel. Explosives, blasting caps, black and white gun powder are frightfully treacherous. Many compounds are heat-, shock-, or friction-sensitive, such as chlorates, perchlorates, fulminate, iodate, picrate compounds. Liquid fuels like gasoline are extremely volatile and explosive, requiring complicated mechanical systems and ignition far too complex for the amateur. Loose powders cannot be packed tightly enough without special equipment available only to industry. Solid fuels must have a binder to control rate of burning to prevent explosions. Solid fuel compounds must be mixed with extreme care to eliminate air bubbles and cracks. The "pro" wears face shields or masks and protective equipment. This is no field for anyone with a little knowledge, where the strength of a fuel increases as the cube of the weight. Three ounces of fuel has 27 times the strength of one ounce!

Amateur rocketry clearly is at the cross roads. "Teen-age rocketry," asks one safety organization, "is it a spawning ground for space scientists or a hot-rod fad, in the unflattering sense of the word?" Practically anyone can buy materials for a home-made rocket. For this reason authorities wonder if legislation will drive the soaring rocket movement underground. Asks Martin Summerfield, editor of Jet Propulsion, "How can you check on what all the cities' kids are building in their cellars?"

Amateur rockets can kill in a split second. "Unless something is done about it," warns George Sutton, president of the American Rocket Society, "deaths and injuries are going to mount and that is a serious, considered prediction."

Deaths and injuries are mounting. In Vancouver, B.C., a boy was overcome and died from breathing fumes of nitrobenzene. The stuff was bought at a drug store. In Jacksonville, Fla., a boy was killed by a rocket that exploded in the garage. A mixture of potassium chlorate and sulphur exploded in the face of a Mount Vernon, N.Y. boy. A Brooklyn High School student was maimed for life by an explosion in a bedroom. A University of Maryland sophomore landed in a Washington Sanatarium with bad burns of face, hands, and back. He was mixing rocket fuel when it exploded. In Des Moines, a rocket was launched accidentally by three boys. It rose 2,000 feet before coming down in a school yard. Fortunately, there were no casualties although the ground was seared for ten feet and the explosion was felt for five blocks. When an Army range was provided, with supervision, for a high school rocket group, several rockets failed, and two fell in flames—but, thanks to adult control, there were no injuries. And so it goes.

Amateur Rocketry may be a public menace. A Special Hazards Bulletin was issued by the Association of Casualty and Surety Companies in New York, urging every effort to eliminate uncontrolled experimentation. The National Fire Protective Association has urged fire marshals and public officials throughout the nation to curtail unorganized rocket experiments. All these organizations acknowledge the plus value of scientifically conducted amateur rocketry, when under proper supervision, in the proper places, and with the proper precautions. The NEPA proposed that experiments be permitted only at specified locations and under strict and well qualified supervision. State-wide communications should be established, claims NEPA,

(*Continued on page 34*)

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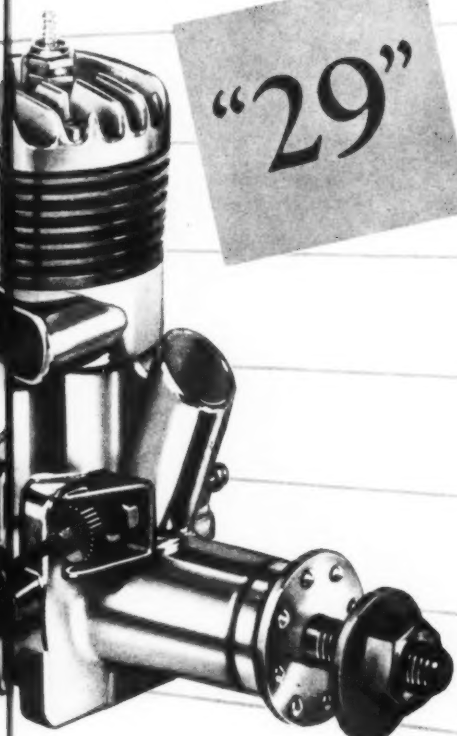

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so that amateurs can obtain advice from experts, preferably through their school systems. Meanwhile, NEPA urged local officials everywhere to prohibit manufacture and launching of rockets by amateurs until these requirements are met. Supervision, unfortunately, is not easily come by. Teachers do not usually qualify as experts. The expert supervisor should be actively associated with the field.

To assist the serious amateur, Atlantic Research (whose recent movie was viewed nationally on TV) has published a booklet on the safety aspects of rocket design, construction, and operation. It describes the choice of rocket fuels and how they should be mixed. "Atlantic Research's message to amateur rocket scientists," says D.O. Myatt, is that if they don't get beyond the stage of launching rockets for its own sake, then what they are doing is merely kid stuff." Atlantic is pushing for smaller rockets, more static testing, and a more mature approach by high school students.

The American Rocket Society spoke of a registry for amateur rocket groups, in order to guide amateur activities into safer channels. The Society's aim is to get the kids out of the cellars and into organized groups.

In its splendid booklet "Rocket Safety Tips" (available from the United States First Army, Governors Island, N.Y.), the Army gives this as honest advice: "If you do not have a supervisor and permission of parents and local authorities, abandon all active experimentation with fuels and chemicals until a program of active assistance is established. Rather, continue your research, and improve your ideas. Build a prototype and check dimensions, weights, and characteristics. A few additional weeks or months may seem long, but the time lapse may save your life.

"This headquarters," states the Army, "does not feel that teen-age rocket enthusiasts should expose themselves, and others, to unnecessary risks of injury, property damage, or possible legal action through premature experimentation with fuels and unauthorized attempts to launch rockets into the air. It has every confidence that a safe and sane program for amateur rocket experimentation will be established eventually."

MAN sincerely hopes so!

Two Stage Rocket

(*Continued from page* 26)

two-stage transition now had to be worked out.

At what time, with stage one in operation, should we cut in the power for stage two?

The eventual procedure was to light the delayed action fuse in stage two and then the fuse for stage one. Time had to be allowed for the engine in stage one to ignite and build up thrust also for the hand launching. The proper fuse would burn for 18-20 seconds, and the engine in stage two would cut in anywhere from 12-15 seconds after the missile was airborne (not from ignition time) on the power from stage one.

The transition cannot safely be stretched to a longer period because the power in stage one may be petering out and the missile then starts its descent before the engine in stage two "blasts off"; adversely effecting the transition and the separation. If stage two is pointing down at a sharp angle, this could mean that it may not be able to recover a useful flight path before striking the ground—due to its limited surface areas. There's not much you can do with the model after such an occurrence!

Having established the requirements for the successful operation of a two stage

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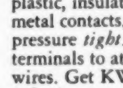

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missile, the prototype was built.

CONSTRUCTION

Keep in mind that performance is inversely proportional to weight. Select wood carefully for necessary strength without increasing the weight beyond the practical maximum of 3¼ ounces.

The hulls of both stages are of similar construction. Cut the bulkheads from the thicknesses of wood shown on the plan. Cut all the centers, and notch all of the bulkheads before assembling. Sand the inside wall of those members that will be cemented to the aluminum lining, as it is necessary to get a smooth surface for the glue to adhere to, when fastening the lining in place.

Assemble both hulls by cementing the bulkheads on the main stringers at the positions indicated. The stringers for section one can be traced on the sheet balsa and cut out. This will avoid having to bend balsa strips to the right contour. Make sure that all the bulkheads are perpendicular to all of the stringers. Cut the various surfaces from sheet balsa of the proper thickness; Be sure the grain of each runs in the proper direction. This minimizes warping and breakage.

When the hull frames of both stages are dry, add the aluminum fire-retarding liners. Use lightweight thin aluminum sheeting for this liner. Aluminum foil is too thin as we sadly found out. (Thickness should be about .005). Fasten metal to the bulkheads with a resin glue, not modeling cement, which cannot stand up under heat. Try to make the inside surface of each liner as smooth as possible because they act as augmentors and increase the power of your Jetex units considerably, if properly installed. As an extra precaution against fire the area directly under and over the Jetex engines must be lined with thin asbestos to further reduce any possibility of fire. (We originally lined ours with aluminum foil and this proved to be a costly mistake.) This last item is a must in stage two where the timing fuse ignites the Jetex wick, when the model is in the air.

After all of the linings are in place cut out all the air duct openings for ventilation. Now add the skin to each missile. Cut 1/32" sheet balsa to approximately the size needed for each section and dampen it with water. Carefully bend it to shape and cement it to the missile. Be sure you select straight grain wood for the skins as it is the easiest to bend without splitting. Three pieces of sheet balsa will cover the second stage but you will find it easier to cover stage one by using smaller pieces of material and bending each one over a particular area. We covered stage one by using eight small pieces of wood, fitting each piece in after the preceding piece was dry and trimmed to shape.

The engine hatches are constructed as shown on the plan. To use a "PAA-Loader 150" piece of ⅛" balsa must be inserted on the formers that make up the hatch, and the unit lined with thin asbestos before the mounting clip is screwed and cemented to the hatch.

The engine hatch for stage two is carved from very soft balsa, lined with asbestos, and the mounting clip for the Jetex 50 unit is cemented and bolted to the hatch. Fit the hatch into the second-stage hull. When you are sure of a tight fit, carefully mark the place where the end of the Jetex power unit is and insert the two rubber-retaining hooks in line with the jet nozzle. This is important, in order that the jet blast from

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T-2	1/8 x 1/2 x 36"	7c
T-3	3/16 x 3/4 x 36"	10c
T-4	1/4 x 1 x 36"	12c
T-5	5/16 x 1-1/4 x 36"	15c

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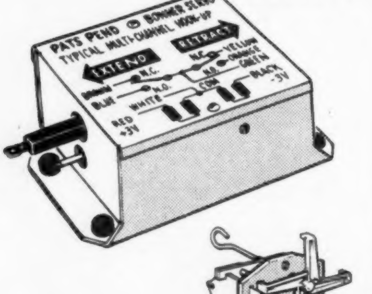

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the engine will burn the rubber band that holds the first stage to the second stage. This is a secondary precaution in the event the timing fuse doesn't break the elastic, prior to firing the engine. We could never tell on the original missiles just what device broke the retaining rubber band, but it always worked when actuated by the timing fuse.

Once the engines are properly mounted and the hull skins are in place, sand the hulls. Carve the respective nose blocks roughly to shape. The nose of stage two can be carved to final shape after it is cemented to the missile. However, the nose of stage one must be carefully fitted and aligned before permanently fitting it in place.

power in stage one. This will provide you with some idea of the missile's flight trajectory before stage two would ordinarily cut in.

You now are ready for a successful two-stage "shoot." Fuses are cut to proper length in advance. Light one of the delayed-action fuses and check the burning time; this should be from 18-20 seconds, if the engine in stage one is fully loaded.

Ignite the delayed action fuse in stage two first, and then ignite the fuse for stage one. Withhold launching for a few seconds until the engine in stage one has started to build up its thrust. Launch the missile with a gentle forward sweep, pointed upwards from about 30° to 45°. The angle of climb may steepen or shallow

BILL OF MATERIALS
(Balsa unless otherwise specified)

(1) 1/32" x 3" x 36" (soft)	Fuselage planking
(1) 1/20" x 3" x 36" (med.)	Fuselage bulkheads, stage two vertical and horizontal surfaces
(1) 1/16" x 3" x 36" (med.)	Stage one vertical and horizontal surfaces, fuselage stringers, and bulkheads
(2) 1/16" x ⅛" x 36" (hard)	Fuselage stringers

Cement; 1/16" plywood; ⅛" inside-diameter, aluminum tubing; 1/32" thick music wire; asbestos liners; thin aluminum foil; .005" aluminum sheet for ducts; soft balsa blocks; clear and colored dopes; decals; sandpaper; Jetex "50B" and PAA-Loader 150 engines; mounting clips.

You will note on the plan that the four stringers that make up the keel of the second stage extend to the very end of this missile. The nose of stage one is slotted to fit these stringers which act as keys to align both units. Carve and fit the nose block of stage one so that it fits into the rear of stage two without rotating. Be sure at the same time though that it does not bind or otherwise remain in stage two. When attached permanently to the first stage, cover the nose block back as far as the aligning grooves with aluminum foil. Drill a 3/32" hole through the nose block approximately ⅛" from the tip for the rubber band retainer to pass through.

Test the fit of the missiles in one another by cutting the rubber band while holding the missiles vertically. When the band breaks, the first stage should fall away without hesitation. If this does not take place, go over the slots for any sign of binding. Do not attempt to fly the missile as a two stage set-up until you are sure this important connection comes apart properly.

Finish both missiles by adding the vertical and horizontal fins. Be sure to add the proper incidence to the horizontal fins and make sure the vertical fins are perpendicular to the missile hulls.

Keep doping and finishing to a minimum to save weight. We used three coats of colored dope on the originals. Each coat however, was thinned over 50%. You have enough dope on the missiles when you see a slight sheen on them. More will only add weight and not aid performance or protection.

Flying: Begin testing by checking out each stage independent of the other. It is advisable to trim them out with a slight tail load, so that after the power cuts, the stages have a tendency to settle in the descent, rather than have a fast, penetrating glide. Stage one, because of its delta configuration and high wing loading is more difficult to trim; use a thrust deflector to control better the power phase of the flight. We found the deflector useful in getting the optimum performance for two-stage operation.

Before attempting a two-stage operation make at least one test hop on just the

in flight depending on several circumstances.

If the climb is sluggish and the climb angle shallow, this may be a combination of an overweight model and/or too slow a power build-up. If the climb angle gets too steep, the missile will tend to peel off to one side or to the other; a situation which may prove damaging. This will result if the center of gravity is too far back.

An excellent method of boosting the power in stage one and getting a much more rapid build-up, is to drill approximately a 1/16" diameter hole through the center of fuel pellets and make the fuse long enough to reach the bottom of the case. By igniting the fuel in this manner the area of burning is rapidly increased. The increased internal pressures produce an increase in the exhaust velocities, and to this action there is the equal on opposite reaction of increased thrust.

The power run is reduced several seconds in this manner, but the increase in power results in a much more spectacular and generally more successful flight.

Once the missile has been completely "debugged," you should be able to obtain a successful two-stage operation at least 50% of the time. Judging from full scale operations, that's a darned good missile operation!

Transistor Servo Circuit

(*Continued from page* 18)

and R3 positions.

Figure 4 provides the link that eliminates rubber band centering devices. It is simply a hearing-aid size 100k potentiometer coupled through additional resistances to the input circuit from the transistorized switching device (Fig. 1). Mechanically coupled so it is centered at neutral control position, any movement tends to unbalance the circuit and bring the servo back to neutral, where the circuit is again in balance. Limit switches are completely eliminated when used as an "all or nothing" servo. For proportional control, this pot makes it possible to hold very fine control settings for trim of the airplane.

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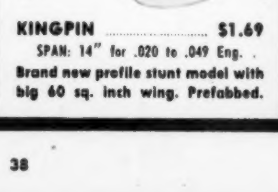

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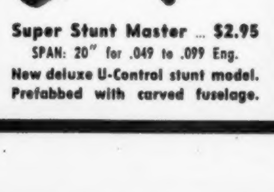

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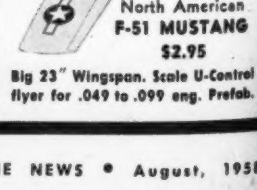

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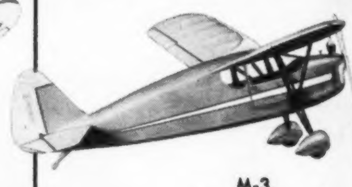

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Radio Control News

(*Continued from page* 18)

voltages. Relay operation is reliable. Housed in a plastic box, this receiver should be mounted on foam plastic cemented to the bottom of the case. Both the receiver and transmitter employ printed wiring. The sample transmitted had good output on the bench without an antenna. Unfortunately, our weekend testing sessions have been hampered, at the time of writing, by too much rain.

• • •

Ernie Kratzet of Bramco has a truly new way of advertising with a personal touch. He uses SoundScriber discs. They are playable on any 33-1/3 rpm record player. Two recent discs tell of the following items: Photo shows the experimental Bramco 5-channel reed bank, as compared to GEM relay. No price or delivery has been announced on this sub-miniature unit. In addition to their regular 5 and 8-channel reed gear, Bramco is custom building a 10-channel set. This simultaneous unit features eight controls from the stick itself: two for rudder, two for elevator and, by pressing a button, the two rudder controls are switched to ailerons—the pressing of a second button switches the normal elevator controls to two trimmable controls. Where are the buttons located? In the tip of the control stick, just like the WW I gun-control joy sticks. The two other channels are by conventional pushbuttons on the side of the control box. What next?

Bramco also sells self cleaning contact relays for $5.45, servo mounting brackets (deBolt servos) for 75 cents a pair, and a new, flat plastic-cased 3-6v servo motor, with ball bearings, for $2.75. For "hams" there is the standard 8-channel simultaneous equipment for 50-54mc operation. Incidentally, the Bramco reed receivers are completely transformer coupled for maximum gain and low quench output when no signal is being received. One other item which Ernie mentioned, is being used by Dick Branstner. This is a ¾" diameter electromagnetic clutch which is built into the hub of Austin wheels. Drawing but 60ma at 3v, Dick has positive wheel braking in a fool-proof manner. The Hycor clutches are dust-free enclosed and weigh very little. Only catch is the $10.00 (apiece) price.

• • •

The Glass City Model Electronics Co., 726 Sherman Street, Toledo, O. has a new line of items for pulse and proportional work. These were so new at the time of writing that we have not had a chance to see or test them. Item one is a pulse proportional actuator of the permanent magnet/double pole piece type. Battery drain is said to be very low and two models are available, heavy duty for $6.95 and the extra heavy duty for $7.95. Item two is a Puls-Air-Pulser, a 3" x 4" x 5" control box giving 3-13 pps and a completely adjustable 60-40 ratio to solid on and off signals. Power is from two D cells. Useful for rudder only, Galloping Ghost or Dual-Simultaneous Proportional control, this unit guarantees drift free operation. Price is $29.95. Item three, for $19.95, is said to provide dual-simultaneous proportional control from any single-channel receiver. It is a completely self contained transistorized pulse-width/pulse-rate device that can be used with any type of actuator. Fail-safe and engine control is available for an additional $9.95.

• • •

Photo shows the new Slimline Servo pro-

PILOT!

by *Sterling* models

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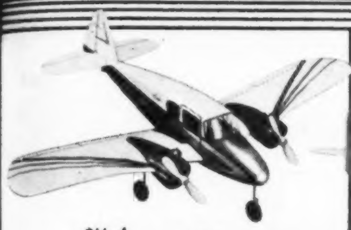
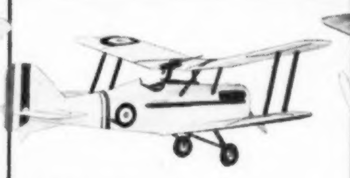


*M-4
Piper Apache
23½" Span
$1.95



$1.95
M-5
SE-5
20" Span

$1.95
M-6
Fokker D-7
21" Span

*.020 Engine Only Recommended for Control Line or "Auto-Magic" Pilot

WHAT IS "AUTO-MAGIC" PILOT?

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BABY RINGMASTER!

S-13
21" Span

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Die-cut parts, finished profile body, formed landing gear and wheels, decal etc.

"Auto-Magic" Pilot is a sensational new device which lets you fly your model CAPTIVE—indoors or outdoors—in a limited area, at a pre-determined altitude. It requires NO PILOT . . . unlike control line flying . . . and eliminates the hazards of free flight!

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"RINGMASTER" CONTEST—253 PRIZES! ENDS SEPT. 1, 1958

duced by Cobb Hobby Manufacturing Co., of Box 31, Powder Springs, Ga. This unit measures 15/16" x 1¾" x 3¼" and weighs 1.5 ounces. Operating on 1½ to 3v, the Slimline Servo is good for a minimum of about 1¼ pounds of thrust, which should make it suitable for almost any normal size plane. Patterned after the Bonner Servo, this new unit draws slightly less current when in operation and sells for but $8.95. Bench tests on our unit have been quite satisfactory. This servo, in conjunction with their Selector '4' Compound Escapement, and Pilot Control box, will give right, left, up, down, engine, tail-wheel and brakes, all from a single channel. A steerable tail-wheel-and-brake unit, operating from the rudder torque rod and elevator pushrod also is available at $1.85.

• • •

Last but not least, info on a new Babcock 465 mc BRC-7A receiver. This 2-channel unit has been radically repackaged in a plastic case, has the 22.5v power source removed from the unit for a wider variety of installations and weighs but six ounces, four ounces less than the original unit. Following are some of the improvements made in this 2-channel receiver: Better than two microvolts sensitivity, improved filters (toroids) for better selectivity, an antenna which gives an improved spherical antenna pattern and which eliminates the extra antenna previously needed for aircraft. In addition, the antenna has a factory-tuned high Q pre-selector for greater RF gain and selectivity and a double-diode limiter which practically eliminates all interference due to random voice modulation and radar pulse. The instruction manual is very complete and carries many hints for the novice as well as the expert. This is pre-release information but all we can say is that our Babcock 465mc single channel receiver and transmitter are still functioning perfectly after two years of service.

CLUB NEWS

Capt. C. G. Robinson, USAF, 4524 S. Lois Avenue, Tampa 11, Fla. advises of a new and active RC club known as the Tampa Trim Tabs. Members fly, and are building, everything from simple rudder-only to proportional rudder only, dual-proportional and multi-channel rigs. Biggest concern is a 300-500 watt transmitter which is assigned to a big fruit company. Operating frequency is stated to be 27.300mc, although it has been checked down to 27.000mc. During the fruit picking season, which is practically all winter, transmissions are made from dawn to dusk, seven days a week. And the California boys think they have trouble with traffic lights. At least this shows the necessity for good transmitter design in order to stay within the frequency tolerance. The stated transmitter is an expensive unit, however, it still drifts. The fliers in that locality are eyeing some of the English designs for super-het receivers. Anyone in the Tampa area wishing to join the RC fun, call Fred Mulholland, 8108 Ola Avenue (WE-5-2910), Tampa 4, Florida.

• • •

The Peoria RC Modelers Club planned to hold an EC Demonstration, planes and boats, on May 4th, with all cash donations going to the Crippled Children's Benefit. This type of thing sounds quite worth while and should get a lot of support and publicity for any local club.

• • •

The North Jersey Radio Control Club has shown U.S. Air Force films, with sound, which covered the basic aerodynamics of various airfoils in relation to

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thrust, drag, lift and gravity. Smoke streams showed the causes for stalling. Sounds like an excellent film for progressive clubs. Contact Paul O'Neill, 269 Mulberry Place, Ridgewood, N.J. One of the club members also has sound films of the '57 Nats.

• • •

Vincent Rasp of the Flying Bisons, Buffalo, N.Y. has a 2"-to-the-foot Boeing F4B-4 powered with a Torp .35, using a 6-channel reed receiver (E.D. Reed Bank) for elevator, rudder, engine and steerable tail-wheel control. Although Vince plans to cover the fuselage with fiberglas, a new completely molded fuselage may be made in order to reduce weight. Incidentally, the transmitter puts out but ¼ watt at the antenna, further indication of the trend away from maximum power.

The Indianapolis Radio Control Modelers Club is engaged in finding a suitable decal for their models. This seems to be a problem with a lot of clubs, since planes, boats and cars are all part of the RC conversation. Most popular model is the Smog-Hog, followed by Babcock's Breezy Jr. Anyone interested in RC activity in the Indianapolis area contact, Mr. R. C. Rhein, 3512 N. Brouse, Indianapolis. Ind.

• • •

The Bridgeport Aeronuts will hold their 2nd Annual Radio Control Model Airplane Meet at the Munroe Airport, Munroe, Connecticut on August 3rd, with August 10th being the rain date. AMA sanctioned, this meet will cover rudder-only and multi, with two judges on each flight. Hundreds of dollars worth of merchandise and trophies should make this a nice mid-summer meet. A. K. Arndt, Wills Road, Rt. #2, Newton, Conn., is contest director.

• • •

The west coast RC'ers should keep August 30th and 31st open for the RC Boat Contest held by the Bay Area clubs in San Francisco and September 20th and 21st open for the West Coast RC Championships, sponsored by the PRCS and held at Turlock.

• • •

The San Leando Channel Masters are also joining the decal craze, which run slightly over 10 cents each. Have a contest and see what talent lies hidden amongst your club members!

• • •

The New England RC Modelers, with the cooperation of the U.S. Quonset Naval Air Station, will hold their New England RC Championship at Quonset Point, R.I. on August 16th and 17th. You have almost all summer to tune up for this event, which last year drew competitors from all parts of the eastern United States. Contact Mr. A. Anter, 92 School Street, Central Falls, R.I. for further details.

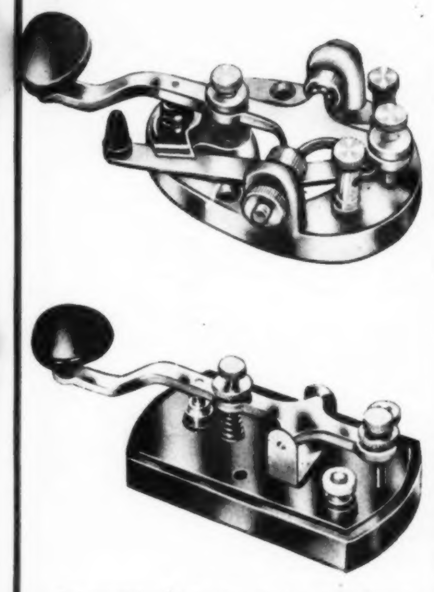
• • •

The Central Jersey RC Club is now underway, specializing in furthering the interest of the novice in RC boats, planes and cars. All those in the vicinity of Plainfield, N.J. are invited to call upon Mr. L. B. Coon, c/o YMCA, Plainfield. They even have a nice park lake which allows internal combustion engine powered RC jobs.

• • •

Once well known for model activity, the Boston, Mass., area has a club known as The L-C Radio Control Club of Metropolitan Boston. They meet once a month on Sunday morning (what, in Boston?) and plan on flying sessions for the other Sundays. Their club paper, Printed Circuits,

has shown many interested tid-bits, such as the fact that GE is working on a gadget for traffic light control on 900mc (hooray) and Dick Barton's 10-channel helicopter and Nate Aptkon's RC Canadian hydrofoil PT boat. For those who want to join this up and coming club, contact Mr. S. McCorrison, 16 Feusler Street, Dorchester 21, Mass.



For practicing code, two keyers by Lafayette. One plain, other ball bearing, silver contacts.

The Conquistador

(Continued from page 12)

line of the wing, the wing is inserted off center in the fuselage, #1 rib being located even with the left hand fuselage side, thus making the inboard panel 2" larger than the outboard panel. This is done so both wing tips will be the same size and shape.

Pick extra hard balsa for all spars, and splice them together. When the spars are dry, lay them over the plan so the spar joints fall over a wing rib connection, and mark rib locations in pencil. Pin the bottom 3/16" spar to a flat, straight surface, and block up tips to proper taper with scrap balsa blocks. Pin the wing ribs in place, and add the top 3/16" spar, making certain the top spar splice is on the opposite side of the wing. Slide the rear ⅛" spars in place through the ribs, and pin in their correct position. Block up the trailing edge of the ribs and pin to a good straight edge, and pin the ⅛" trailing edge spar in place. Now pin the ⅛" leading edge spar in place, and line up the whole wing. A little extra care here can save a headache later. When you are sure the wing is lined up perfectly, cement around all rib-spar joints.

Cut the trailing edge tips from medium 1/16" sheet, and cement in place, top and bottom. Again check thoroughly for warps and twists. Add the top piece of 1/16" sheet 1" wide to the trailing edge. For the leading edge planking, pick soft 1/16" by 3" sheet balsa, as this will have to bend around a double curve. Thoroughly soak the sheet in hot water, before application. Cement to the top 3/16" spar first then,

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For several years Ace has worked with top R/C designers to produce exclusive designer-approved control kits, in which the designers themselves have selected and approved components used. Here are some ACE R/C exclusives:

WORTH Simpl-Simul Pulser

Now - go multi with proportional rudder and elevator with the Simpl-Simul by John Worth. Converts single channel CW or audio receiver and transmitter to give proportional rudder and elevator with true stick-type control. Receiver must be capable of following 10 cps.

Ace Simpl-Simul kits approved by John Worth are complete including 5% resistors and individually matched capacitors where required. Chicago Telephone pots are used for reliability and dependability. Metal parts are stamped and punched, 4x5x6 aluminum case is silk screened. Sigma 4F relay and 1AG4 tubes. Complete except for batteries.

Only **$21.95**

GOOD TTPW Dual Units

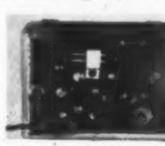
Ultimate in R/C fun, the WAG Dual system has stick-type control. Nearest thing to actually flying. Smooth proportional control of rudder and elevator and fail-safe operation of motor control. Dr. Walter A. Good personally selected components used.

Complete receiver kit with all tubes and relays. **$39.95**

Complete transmitter kit with tubes, xtal, cabinet. **$74.95**

MARCY Single & Multi Kits

Fabulous new audio system by Marcy Inkmann. Begin with single channel equipment and expand up to six without obsoleting any equipment along the way. Simple filters, instead of expensive toroids, hold cost down. Filters have band width of at least 200 cps, preventing transmitter drift and eliminating adjustment worries.



Single channel MarcyTone Receiver measures 2x2-7/8x1, weighs under 3 ounces. Includes tube, three transistors, relay, filter, all capacitors and resistors. Only. **$17.95**

MarcyTone Transmitter contains two 3A5 tubes - MOPA RF and multivibrator audio; Variable Frequency Oscillator, permits selection of 1700 to 7000 cps; slight modification allows unit to be used with other single channel audio receivers; 100% modulation; aluminited case 3x5-1/2x8 inches; expandable merely by plugging in control box; complete with tubes, 13 mc crystal, resistors, capacitors - everything required except batteries and 3 foot section music wire antenna. . **$18.95**

6 Channel MarcyTone Receiver - Basic RF and amplifier unit as well as 6 filters, 6 relays, 8 transistors and all other required components. Weighs under 10 ounces **$53.95**

6 Channel Control Box, converts transmitter above. **$18.95**

New catalog supplement 58-3 describes units in detail. . .it's FREE!

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working from the center of the sheet to the ends, cement to the leading-edge spar. Pin to each rib as you go, to keep planking tight against the ribs. When completely dry, remove from the board, turn over and repeat on the other side. Go over all the joints again with a glue gun, to insure a thorough bond. Now add the 3/32" sheet tips, and 1/16" scrap ribs. Cement in the bellcrank floor and brace, and install the bellcrank and lead outs. Add cap strips and center section planking and sand completed wing to shape, making the leading edge round.

The flaps are cut from medium soft ¼" sheet balsa, sanded to an airfoil section, and hooked together with a large Veco flap horn. Do not connect the flaps to the wing until later.

The rudder and stabilizer are cut from medium ⅜" sheet balsa, the center of which is cut out as shown. The ⅜" x 1/16" strips are cut to size and cemented in place as shown. Taper the rudder and stabilizer from ⅜" at the center, to 1/16" at the tips, and sand to airfoil shape. The elevator horn is now installed, and the stabilizer-elevator hinges are cemented in place.

The fuselage is conventional, being made slab side, box fashion. When selecting the ⅜" sheet balsa for the fuselage sides, pick good hard wood, preferably quarter grain, or good straight grain. Cut to shape on side view of plans, and cement 1/16" plywood doublers in place. Drill a series of 5/32" holes throughout the doublers to give a better bond. Pre-cement all parts before final assembly. The engine mounts are cemented in place, care being taken to line them up exactly as shown. Note that the thrust line is not the same as the top of the ⅜" fuselage sides, as extra depth was needed toward the rear of the 3" fuselage sides.

The landing gear is bent from two pieces of 3/32" piano wire. This method makes a better gear than one heavy piece of wire. Instead of springing back and forth on contact, the two wire gear springs up and down. There is enough up and down spring to smooth out most bumps, but little chance of the model tripping over, which is so common with the single wire gear. The double wire gear is rigid enough to cut through most tall grass, as my model hasn't flipped over on a landing yet.

Mark landing gear position on the plywood formers, and drill 1/16" round holes at the landing gear corners. Slide small cotter pins with 3/32 eye opening on gear wire, and push through formers. Place small washers over the back end of the cotter pins, and solder. The landing gear will be finished later.

The fuel tank is made now, as it is built into the fuselage. The fuel tank is the one vent, pressure type, which I have used for years. By using only one vent there is very little likelihood of spraying a stream of fuel all over the airplane when the engine is running or when the plane is in flight, as air is forced into the tank to equalize the fuel which is drawn out to operate the engine. Also, when in flight, the forward motion of the plane forces air into the tank, giving a pressure feed. This eliminates changing engine speeds in violent changes of direction. I also find I can set the engine run lean on the ground, and it will run to this setting throughout the flight.

To fill the one vent tank, stand the plane on its nose and pump the fuel in until it starts running out the engine venturi. You fill the tank and clean out the needle valve jet hole in one operation.

Use an empty fuel can which is in good condition on the inside, cut off the ends and open up flat. Mark the outlines 1" x 2" x 3½". Bend so the inside of the can becomes the inside of the tank. Solder across the top, bend the filler vent tube from 3/32" I. D. (inside diameter) tubing (brass), and face it directly forward. Solder securely to the inside of the tank at the bottom, bringing out of the top of the tank ½" from the front left hand corner to clear the engine mounts. Install the front of the tank and solder securely. Now solder the 3/32" I. D. brass engine feed line into place, in both the front and back of the tank, taking care to keep on center line of the 1" side. Close up the back of the tank and solder securely, and clean out the inside of tank with methanol. Pressure test finished tank under water, as it must be absolutely air tight to function properly. The tank is built into the fuselage so it must be right; however, you can get at it from the bottom if necessary.

Now cement the firewall and landing gear formers in place, with the tank in its proper position. Bind the bottom of the landing gear with copper wire, after posi-

(*Continued on page 46*)

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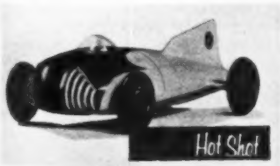

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tioning the gear and the wheel-pants keeper. Solder securely. Cut a piece of ⅛" scrap balsa to fit between the gear wires, and cement in place. Sand to airfoil shape and cover with silk.

Tack cement the 1" x 2⅜" x 33" soft balsa fuselage top block in place, and carve to shape. Remove and hollow to ⅛". Insert the flaps in the fuselage, slide the wing in place, and cement thoroughly. Install flap hinges to the wing, cement stabilizer in place, hooking up the pushrod as shown, recement the top into place, and plank across the bottom. Cement the rudder on, and the flap and elevator fillets.

The cowling is made from a 1" x 2⅜" soft balsa block, and a ⅜" x 2⅜" block, which are cemented together to make the required depth. Carve to shape, and hollow to ⅛". Plastic balsa fillets are formed around the wing and flap fillets, and stabilizer elevator fillets, working to shape with your finger.

Cover the wing with silk and clear dope until all the pores are filled. The rudder, stabilizer and elevator are covered with Silkspan, as this will pick up less weight in finishing.

Brush two heavy coats of wood filler on all exposed wood parts, and then sand back down to the wood. Apply two or three coats of clear dope to the rest of the model and sand lightly. The whole model can now be color doped and trimmed to your taste. When finished, cut the bubble canopy to fit and, using a few pieces of masking tape, stick to fuselage, running a fine ribbon of cement around the edge. If you wish, dummy exhaust stacks may be added to dress up the nose.

Pick a fairly calm day to test fly, and for the first flight use only ¾ power. Don't try to be fancy until you are familiar with how the model responds. You will find it to be extremely groovy, and very easy to handle, but it can also make square corners really square.

I like a fast flight with plenty of pull on the lines, so I use the silver restrictor in my Torp, but if this is too fast for you, change to the green restrictor.

A word of caution. If you are flying in a strong wind, open up those maneuvers because this model really moves.

Foreign Notes

(*Continued from page* 7)

layer control and one solution here is surface spars to intercept the covering sag behind the leading edge. Australia's Jim Fullarton used them on his 1958 Australian Nationals winning Wakefield and gives them the credit for the model's excellent glide. For the benefit of the sceptics, Jim quotes the example of the dimples on a golf ball . . . put there for the same purpose because manufacturers discovered that the dimpled ball could be driven farther than a smooth one. . .

CZECHOSLOVAKIA

Czechoslovakia is expected to present a really strong challenge in the FAI free-flight gas World Championship event this August at Cranfield, England. For this and other FAI f/f and teamrace events, the State sponsored Model Research Center at Brno which was responsible for the last year's World Champion speed engine, is producing appreciable numbers of a high-performance Diesel known as the MVVS type 2.5/1958.

The engine shows some changes from the prototype unit described in our May column and the exhaust stack is now at the side instead of behind the cylinder. Claimed output is .310 brake horsepower at 15,800 rpm which, if generally representative of stock models, would definitely put the MVVS on a par with the Oliver. The motor has a bore and stroke of 15 x 14 mm. (.5905) x .5512 in.) giving a displacement of 2.47 c.c. or .151 cu. in. and weighs 5 oz. It is of the front rotary type with twin ball-bearing shaft.

SWEDEN

Winter flying on frozen lakes is quite the thing in Northern Europe. Times are often surprisingly high. In the Annual Swedish Wintercontest held at Norrtalje there were 120 entrants and the top two in Wakefield both exceeded the five-flight maximum score. Winner in A2 was well-known Rolf Hagel, also with a perfect five-flight score of 900 sec. Gas event went to free-flight expert Hans Friis with 845 sec.

WEST GERMANY

We hear that the German OMU radio-control manufacturers have taken over production of Stegmaier's 8-channel vacuum-actuated radio-control equipment. . .

Rumored from Webra: two new motors in the .15 and .20 cu. in. classes named, respectively, Comet and Bully. . . . Hobby shops are now accepting orders for the Webra-built Ruppert Twin, latest provisional price of which is approx. $60.00. . .

The German RC Nationals, separate from the free flight and control-line contests, was to be held at Darmstadt, July 1-2.

Simpl-Simul

(*Continued from page* 23)

ing the centering crank to 1/4" or less permits high rubber tension to be used for snappy action yet does not excessively limit actuator motion. A pulley on the centering crank helps to hold the rubber band in place and reduces friction to prolong rubber life.

Crank Stops: Positive limiting of crank throw makes centering tension and actuator voltage non-critical. With fresh batteries, the crank drives quickly and provides very effective up elevator since the crank dwells momentarily on the stops between pulse reversals. As the batteries taper off, crank swing slows up and limiting is accomplished more by the rubber tension than by the stops. Up elevator becomes less effective, but the transition is gradual. Ample warning is given over a period of several flights; in fact, many fliers obtain extra flights by simply reducing rubber tension slightly to loosen crank action. Good system voltage tolerance is indicated by the fact that with three volts nominal actuator power reliable operation down to almost two volts is normal.

Tail Crank: Details of a deBolt Champion model installation are given (Fig. 5), but crank shape and size will vary with different models according to the factors of: distance between torque rod and elevator centerlines, location of torque rod above or below the stabilizer, the amount of control movement desired. In any case, the crank throw should provide neutral elevator when the crank is displaced 40 to 50 degrees from the center or neutral rudder position. In different models, this may require an elevator yoke above, in line with or below the elevator trailing edge. After bending the elevator yoke to obtain neutral elevator with the crank at approximately 45 degrees from center, correct proportional action is automatically provided and more or less elevator throw is then obtained by adjusting the elevator yoke to ride the crank nearer or further away from the elevator pivot. Rudder yoke may be either ahead of or aft of the elevator yoke, but allow for the fact that the latter slides slightly fore and aft on the crank during operation. Avoid using wire heavier than .040" for yokes as too much mass requires

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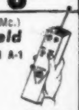

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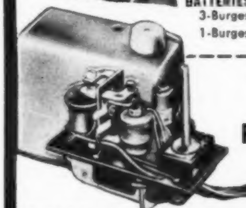

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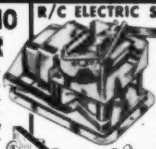

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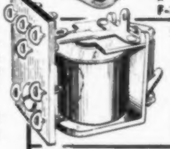

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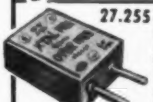

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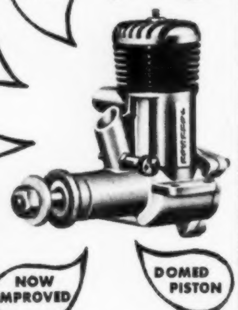

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Linkage Freedom: There must be no binding in the system. Avoid close tolerances on yokes, bearings and hinges. It's a good idea not to anchor yokes too well until final linkage construction is approved; pulsing may reveal problems that require changes to be made. Lots of play in the system is not harmful as the wide range of control available compensates for loss through slop. The linkage should work perfectly without lubrication and with the model held in all attitudes. Once the system works perfectly while dry, light oil can be added sparingly at friction points to hold down wear and corrosion. Don't depend on solder alone for music wire joints. Wrap before soldering with strands from hook-up wire to aid fatigue resistance. Finally, go over all glue joints several times to make sure they will hold up under the punishment of continuous flapping.

Control Surfaces: Great control effectiveness is provided by large rudders and narrow-chord elevators. In comparison with a typical escapement rudder, half again or even twice the area has worked out well. But elevators seem best with an average chord less than 1", even on a Live Wire Cruiser size airplane. This is not to say that conventional elevators, such as those used on the Champion, are not satisfactory, but that more effectiveness can be obtained with less surface area. Don Brown's .15-powered Esquire flew inverted with elevators of only 1/4" chord! Narrow-chord elevators reduce hinge moments and allow the actuator to put more of its power directly to work, without being wasted in lifting large floppy surfaces. Elevators are best if full span and are very effective if simply hung on the straight trailing edge of a conventional stabilizer. Angular travel of surfaces is desired to be at least 20 degrees each side of neutral, with up to 45 degrees acceptable. With large rudders, less throw is needed; likewise, narrow-chord elevators should use maximum throw. Hinges should be very free and simple fabric or cross-thread types have proved to be excellent. Static and/or aerodynamic balancing of elevators will help to increase effectiveness for maximum maneuverability without overloading the actuator and permits lower voltage.

COMPONENT RECOMMENDATIONS FOR RELIABILITY

Actuator: Practically all S/S flying to date has been done with the Mighty Midget motor, including the commercial Robot Jr. actuator which does the same job with different linkage. The M-M motor has good torque, low current drain, positive starting and reversal, plus a built-in reduction gear just right for the S/S. However, the M-M is plagued by fragile construction and has become reliable and rugged only through modification. Brush blocks should be secured against vibration loosening by applying a generous coating of Goo or Pliobond type cements. Simply coat the cement over the brush terminals (after wires are attached), covering them completely and also the adjacent portions of the plastic motor case. Reinforce the motor mounting lugs and the case by extending a 1/2" wide strip of .010" thick aluminum or brass from one lug, across the top of the motor (under the reduction gear shaft), then down to the other lug. Less necessary, but still worthwhile, is another strip underneath the motor from lug to lug. A balsa block cemented to the floor and butted against the forward end of the motor is also recommended to take impact loads.

Another motor which looks very promising is known as the Minitone. It has good mechanical construction with electrical performance very similar to the M-M. This motor may eventually be preferred to the M-M for most proportional pulse actuator use since it appears to be built for more wear and tear. Meanwhile, the beefed up M-M is quite capable of more than a hundred flights before wear of its plastic bearings becomes excessive. Its low cost, however, suggests replacement when sloppy rather than stretching operation too far beyond the M-M's initial reliable performance period.

Relay/Receiver: If no more than a 2 ma current change is available, a Sigma 4F relay is recommended. With at least 3 ma swing, the subminiature Gem relay is completely reliable. The relay should be adjusted well within the middle of the receiver current change values; at least .5 ma should be available beyond the pull-in and drop-out current settings of the relay. Whatever relay is used, spark suppressors should be wired across the contact points to prevent pitting and adjustment shift—the simple condenser-resistor hookup shown as part of Fig. 1 has worked very well. Ceramic condensers are recommended and the resistor can be a common 1/2 watt 10% tolerance carbon type.

Besides providing adequate current change, the receiver should pulse well. The old standby Lorenz two tube receiver in the original and later Gazistor variations

(*Continued on page* 50)

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are fine for the S/S. But if diodes are used to couple a hard-tube second stage, the Lorenz may or may not be satisfactory—some versions have a lagging pulse response. Best bet is to try operation while pulsing at high rates; no skipping or erratic action is acceptable. The same goes for hard tube receivers since not all pulse well. Several which have worked well are the Controlaire Sm-1, the Citizenship 27, the Essco THT.

Batteries: Requirements may seem high, but remember the great control provided. For smallest ships, four pencells supply adequate power in two pairs for a dual 3-volt system. Above .15 powered ships, use four medium cells or eight pencells to supply longer life power for 3-volt systems. For Cruiser size ships, 4½ volts may be used if 3 volts is not enough for solid up action—this is more than adequately provided by 9 pencells or 6 mediums (at this stage, however, subminiature wet cells offer substantial savings in weight and size; 4 volts is ample for any installation). More than 3 volts is desired on large models if control surfaces or linkage loads up the actuator so that it drives through 270 degrees at low pulse rates only with very light centering tension. Also, if it is desired to operate at higher pulse rates to prevent model waggling, higher voltage may be necessary for faster actuator response.

FINAL CHECKOUT

Synchronization: First item to check is agreement of model equipment response to pulser stick movement. All linkage and tail surfaces should be installed and actuator batteries should match closely in load voltage; measure while momentarily stalling the motor. With the stick neutral and pulser clicking away, switch on the transmitter and then the receiver. Listen to the receiver relay—it should bang away cleanly and sound just like the pulser relay, with no skipping at extreme pulse widths and high rates. When satisfied that the relay sounds okay, switch on the actuator circuit. The crank should swing symmetrically on each side of neutral with the stick centered and should move to the right with right stick and left with left stick. If opposite, reverse actuator battery polarity.

Centering Tension: Adjust for the highest tension which will let the crank swing through a 270 degree arc at lowest pulse rate (about 3 cps), with neutral rudder signals. Then shift to high rate (at least 6 cps) to check for a crank swing of not more than 45 degrees total arc. Increase the maximum pulse rate by pulser readjustment, if necessary, to shrink the arc for positive down elevator—approximately 9 cps will shrink the arc to about 20-30 degrees. Final tension adjustment should be made after brand new batteries have eased down from their initial peak voltage.

Symmetry: Looking at the tail of the model, with the control stick centered, note if the crank oscillation is equally divided on each side of center. If uneven, see if the unbalance changes, more or less, when actuator battery sets are interchanged. If it does, the actuator battery voltages are excessively unmatched. Also, try switching actuator battery sets so that polarities are reversed. If unbalance then shifts to the opposite side but otherwise is similar to that previously noted, the receiver relay may need slight touching up to center the action. If unbalance persists despite balanced voltage, best relay adjustment and clean relay points (both pulser and receiver), the pulser probably needs finer trimming of the width pots. Juggle the control stick pots slightly from the positions obtained during the check-out procedure described in the previous article. Make pot adjustments in very small

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amounts, always noting previous pot position for comparison, until a fair compromise is reached. Check frequently by watching the surfaces flap and noting the crank swing pattern changes as the stick is moved.

Occasionally, all efforts to balance the pulsing may not be successful. A few cases have occurred in which a slight pulser circuit change was necessary. Across the pulser relay was shown a .1 mf condenser and a 10k resistor in series to provide suppression of the inductive kick which results each time the relay coil is de-energized. The kick, which can interfere with circuit action, may get through one set of components and not another, though both are similar. If this rare condition is encountered, the condenser and resistor might better be replaced by a diode. One which has worked well is the Federal 1T1—wire the Cathode end (plus) to eyelet B and the other end to Flea Clip L1, eliminating the need for eyelet A.

Acceptable Performance: Don't be too fussy. Getting control action in the right direction is initially more important that getting any definite amount. Most likely it will be noted that in maximum down elevator position full rudder control will be obtained with very little stick motion on either side of center. Further side stick motion may in fact produce a rate slowdown which actually results in up elevator rather than down. This condition is not serious and is usually caused by having too much pulse-length variation available. Most fliers simply do not use full side stick deflection in full down elevator or merely block off the stick hole to prevent excessive side stick movement. The important thing at first is to get in the air with positive up, down, right, left and a roughly centered neutral. Later, the model and the pulser can be trimmed as needed for most control effectiveness. Even a crudely balanced pulser provides more control than is usually necessary for testing.

Initial Flying: Be alert from the instant of launch as the model responds immediately to every stick motion. In fact, for hand glide tests, it helps to have an experienced hand at the stick to fly the model through the heave. A poor launch is instantly correctable and a considerably out of trim model can be successfully flown. But make the S/S introduction easy on yourself by having the model in good trim before flying; if possible, let a practiced dual proportional flier get the ship to altitude before taking over; keep first flights short. Until you get to be in full command of the model, early S/S flights can be rough on the nervous system, particularly if you're used to escapements and their hands off rest periods between beeps.

A stable model will also make S/S flying easier since it will be less sensitive. The simplest assurance of stability is a center of gravity location between 25 and 30% of the wing chord, with between three and five degrees incidence difference between wing and stabilizer. Freedom from warps is also a great help. Use more power than you would for initial rudder-only flights, to help pull through stalls and to aid penetration. Spring centering on the control stick is not recommended for early flights since an out-of-trim model calls for offsetting the stick to compensate and this is easier to do if not opposed by spring forces. After landing, switch actuator circuit off before stopping the pulser. This prevents one set of batteries from getting more use on each flight as would happen with repeated stalling of the actuator motor be-

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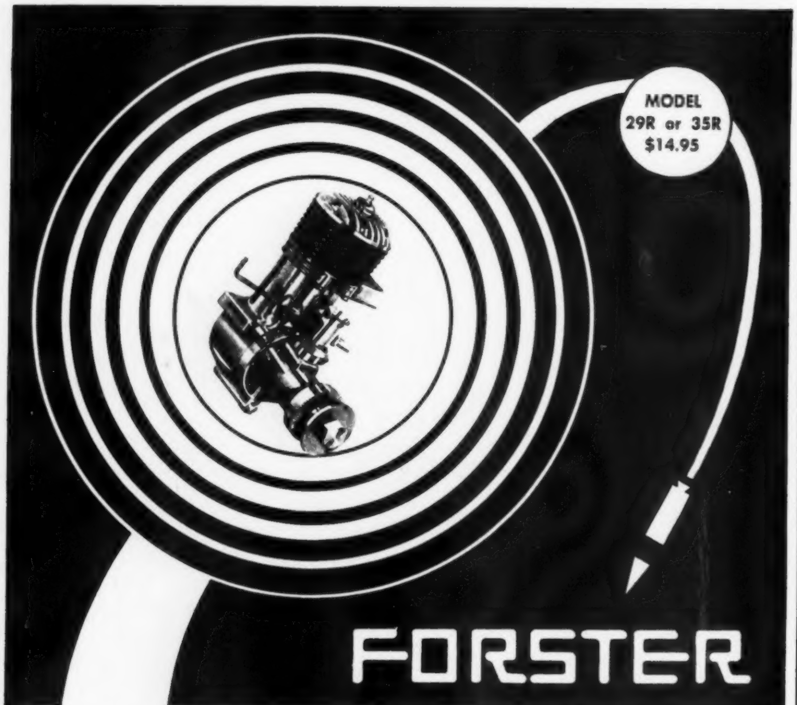

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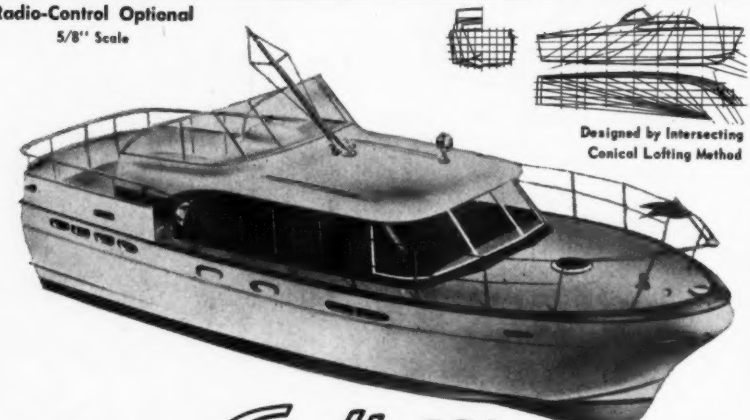

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fore the model is retrieved.

The next article will cover hints of model trim and flying as applicable to the Simpl/Simul, besides providing details of system variations for additional control. Meanwhile, the system invites adaptation to existing models for maximum control at minimum cost. For most, the S/S needs no further elaboration to provide the greatest sport flying satisfaction. For others, the information to follow will indicate how to get more out of the S/S for hotter piloting.

The Orbit

(*Continued from page* 19)

build a Half A speed model. The Orbit A, B, and C flew so well that I decided to build the Half A using this design. There were two other Orbit Half A's built by two juniors, ages 11 and 15. The 11-year-old boy flew his model successfully the first flight without a mishap. He had never flown a speed model before. The 15-year-old boy is Hardy Lewis, Jr. He now has flown his model at the Southwest Model Airplane Championship and the '57 Nationals at Willow Grove. He won first place at both of these contests! He turned 90.60 mph at the Nationals. The success of these two boys with their Orbit Half A's should make the model worth your time to build.

I finished my Orbit Half A two days before we left Dallas for the Nationals and Leland test flew it twice, and turned speeds of 95 and 102 mph. So my hope of placing at the Nats seemed good. Hope became reality when I placed second at the Nats with a speed of 96 mph.

Leland said the Orbit Half A flew better than any such speed model he has flown and he has flown several different designs of models. He said it controlled and flew like a larger class of model.

The Half A weighed 5⅝ ounces, slightly more than most Half A's. I believe that an ounce or so more weight will not slow the speed down any when models get this small. I have found that a Half A that weighs a little more will fly more stable in the wind. I built one Half A that weighed 3½ ounces and I couldn't keep it out on the end of the lines when flown in the wind. At most contests that we go to the wind is flowing ten mph or more.

The engine I used was the Thermal Hopper, but you could use any Half A engine you want to. The Thermal Hopper has no exhaust stacks so I formed some stacks from shim stock and soldered them to the cylinder. You have to be really careful not to get solder inside the cylinder. Unless you are familiar with soldering I would recommend that you not risk ruining a cylinder. I believe that it helps a

(*Continued on page* 54)

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little though. The engine mounting bracket is made from 3/16" aluminum as shown on plans and bolted to rear of engine. Cut engine backplate to shape of engine mounting bracket. The spinner should be cut down to fit the pan. I used a Froom S9L 1⅛ dia. aluminum spinner.

The aluminum speed pan should be sanded smooth and polished. Sand the pan first with 100 grit paper and finish with 400 grit. Use polishing compound on an electric buffing wheel and polish pan to a high gloss. Shape skid from 1/16" stainless steel and bolt to pan. The aluminum speed pans are L&H Specials as mentioned on the plans and were designed especially for all classes of the Orbits to get the shape thought best. Drill and tap holes for motor mounts and tie downs. All holes that are tapped were drilled with #50 drill and tapped with a 2-56 tap and the holes that are not tapped are drilled with a #44 drill. Mount engine after all holes are drilled and tapped.

The wing outline is transferred from plans to 3/16" thick basswood and sawed to outline of wing. Sand edges smooth and mark center line around outside edge of wing blank with pencil. Carve airfoil into wing blank with a symmetrical airfoil with maximum thickness 30% back from leading edge. The wings for all classes of the Orbits have a symmetrical airfoil with maximum thickness 30% back. After the wing is carved to desired shape, sand smooth and mount Half A Mono-line control unit as instructed in the instructions that come with the unit.

The rudder and stabilizer are sawed from 3/32" plywood to outline as shown on plans. The outlines are transferred by laying a sheet of tracing paper or onionskin paper on the plans, and tracing outline on the paper. Cut out the outlines with scissors, place the paper outline on the wood, and draw around the outline. The rudder is sawed out and the symmetrical airfoil is sanded into the rudder as shown on plans. Saw elevator to outline and drill holes for mounting to pan. Bolt elevator blank in place. Mark outline of pan on bottom side of elevator and, when sanding airfoil into elevator, leave flat the portion of elevator that touches the pan. Remove from pan and sand symmetrical airfoil into elevator. After sanding is finished, saw controlling surface from elevator and install control horn that is formed from 1/32" music wire as shown on plans. Cloth hinge is inlaid in bottom side of elevator and covered over with scrap basswood.

Drill holes in basswood fuselage block to match tie-down holes in pan. Bolt fuselage block to pan and mark outline of pan on block. Remove from pan and saw block to outline. Carve out block to fit over engine and then finish carving fuselage to shape, inside and out. Remove section of fuselage over wing and cement wing in place and then cement section of fuselage back in place over wing. Cement rudder in place.

The cowl is constructed from basswood and balsa as shown on plans. Wrap two layers of masking tape around cylinder fins before cementing cowl on fuselage. This will prevent the cowl from touching the fins and causing the engine to overheat. The cowl is cemented on fuselage with engine and pan bolted in place.

Form pushrod from .045 music wire and hook up controls. Make sure that controls operate freely before flying. Free controls is the main thing about flying with Mono-line.

Sand entire model as smooth as possible before painting. The finish that I used

(*Continued on page* 56)

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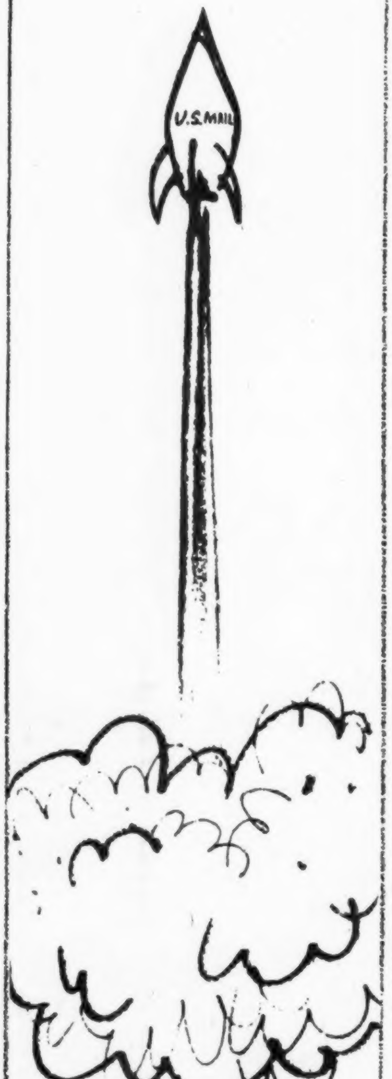

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was two coats of red fiberglas resin that has been sanded and polished with a buffing wheel on an electric motor. I had to be very careful not to let the model bang on the wheel. You can guess what that would do! This type of finish is a lot of work but the end result is gratifying. There are other finishes that look good too, so use your favorite method. All my Orbits are finished in fiberglas.

Before flying a Mono-line speed model I suggest that you have some flying time in with a Mono-line trainer of some kind. We have had good luck with taking off from wing lock-on dollies so I suggest you do the same if possible. I hope you will be pleased with your Orbit Half A.

Early Birds

(*Continued from page* 14)

Ford, he was surpassed by men with greater imagination.

The small selection of early biplanes shown here gives some idea of the different approaches to powered flight in this era. Not that it was exclusively devoted to the biplane. By no means. In the next installment we will take up the matter of monoplane and see how France stole the lead in the development of the airplane, a lead they held for many years and which, oddly enough, they seem to be in a fair way to recapture today.

THE AIRCRAFT ILLUSTRATED

Silhouette under title: The original Wright Flyer. 1 h.p. Wright engine. Prone pilot. Warp wing lateral control.

Santos Dumont Voisin: First plane to fly in Europe. Strictly a "Canard" (tail-first) design it had no provision for lateral control beyond the exaggerated dihedral of the wings though at least one modification had crude ailerons mounted between the wings at the outer panels. Pilot stood in a sort of wicker basket as shown.

Henri Farman Voisin: First plane to officially (The Wrights had done it long ago) complete a closed circuit, taking off and landing at the same spot. Voisins of the period were powered with a 50 hp Antoinette V-8 engine designed by the great Levavasseur of whom we will hear and see more later on in this series.

Breguet: Nicknamed "The Flying Coffee Pot" this remarkable biplane had monospar wings and was one of the first airplanes to employ steel tube construction. Breguet was also among the first to appreciate the importance of fairing.

Wright Model A: Still a dead end design it was nonetheless one of the most prolific aircraft for many years. Pilot is now seated and engine power increased to 25 hp. First airplane procured by the U.S. Air Force (Army Signal Corps).

De Havilland: Designed by Geoffrey de Havilland and flown by him this airplane had a horizontally opposed water-cooled engine, shaft transmission to the two pusher props which, incidentally, were the first adjustable-pitch propellers ever used. Today the name DH is as famous as it was fifty years ago.

Dufaux: Not much is known about this aircraft beyond the fact that it was first Swiss plane to fly and was one of the earliest tractor biplanes. The mid-wing ailerons are reminiscent of the early Curtiss.

Curtiss "June Bug": Made the first public flight in the U.S. and won the "Scientific American" Trophy in 1908. It was powered with a Curtiss-built 50 hp V-8 engine and paved the way to the later Curtiss designs which for many years were, next to the Wright, the only aircraft produced in numbers in this country until the advent of World War 1.

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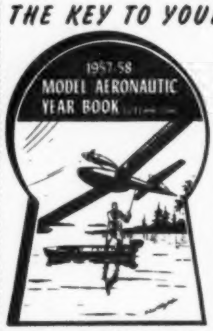

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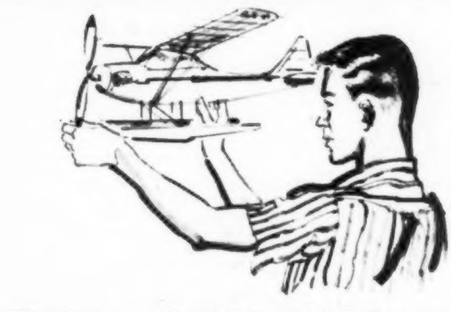

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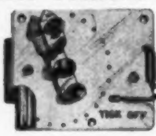
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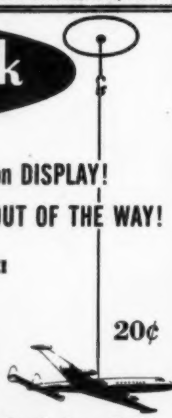

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(*Continued from page 25*)

The throttle control system outlined here takes no special tools—just drill and soldering iron—so lets start.

Bellcrank and control line pivot: Use a standard Veco or Perfect bellcrank of size required for plane being built. Cut off motor end of bellcrank just inside the lead-out hole. From steel, brass or aluminum (dural) form bellcrank pivot extension. Clamp pivot extension and bellcrank together, in position required, and drill through for rivets. Install rivets and rivet securely. Make sure the loop formed by bellcrank pivot extension will allow 1/16" O.D. (outside diameter) brass tubing to pass through freely. Drill through pivot extension two holes 3/16" diameter, in line. Be sure these holes are at right angles to pivot extension. For vertical pivot post, cut a length of 3/16" O.D. brass tubing long enough to extend approximately 1/16 in. above and below pivot extension. At the center of the length of the vertical pivot post, cross drill 1/16 in. diameter through. For horizontal pivot cut a length of 1/16" O.D. brass tubing of a length to extend approximately ¼ on each side of pivot extension. Make four brass washers of diameter smaller than thrust bearings being used.

Drill two of these washers 1/16 in. diameter and two 1/32 in. diameter. Assemble one washer, with 1/16 in. diameter hole, on horizontal pivot tube, flush with end, and solder securely. Assemble vertical pivot post in bellcrank extension. Insert horizontal pivot through bellcrank extension, through vertical pivot post and add washer on other end of horizontal pivot as before. Center horizontal pivot in bellcrank extension and solder horizontal pivot to vertical pivot through center of vertical pivot post. This assembly must pivot freely.

Using solid wire of diameter to fit through horizontal pivot tube, cut a length to extend through bellcrank pivot and past wing tip. Form small loop in end of lead wire, then bend loop at right angle to wire. Slip one washer, with 1/32 in. hole, on lead-out wire, against formed loop. Solder washer to loop. Assemble a ball-bearing thrust washer on the lead-out wire against the washer. Slip lead wire through horizontal pivot tube, add another thrust washer, and the last washer. Solder this last washer to the lead-out wire. Lead-out wire must turn freely.

Connect standard lead-out wire to rear bellcrank hole in conventional manner. If connection between throttle control lead out and throttle control is to be completely enclosed in fuselage, add control horn as required. Install bellcrank in fuselage and make sure it operates freely. Extend special lead out and conventional lead out to wing tip in standard way.

If connection between lead out and throttle is to be outside fuselage (such as is possible when lead outs extend out of fuselage under wing and through a line guide at wing tip), then install bellcrank in fuselage. Extend lead outs out of fuselage, install control horn on special lead out and extend both lead outs through wing-tip guide. Make standard loop on end of conventional lead out. Make hook-up tab for special lead out. Drill two holes, one for small screw (4-36) and one to hook lead out wire through. Hook lead out wire through tab and solder securely.

If connection between special lead out and throttle is to be inside fuselage, make right-angle bellcrank or other necessary accessories (see schematics) and install inside fuselage. Make hook-up between lead out control horn and throttle or accessories using 1/32 in. solid wire.

Control handle and Mono-Line actuator: Make flying handle from hardwood to size required. Drill through one end of handle for 1/16 in. diameter wire. Make four washers approximately the diameter of ball bearing thrust washers being used, and drill through 1/16 diameter. Using a six inch length of 1/16 diameter wire, solder one washer about one inch from one end. Slip on one ball bearing thrust washer against this washer. Add another flat washer do not solder), now slip wire through hole in handle, add another washer (do not solder). Then add a thrust washer and then the last plain washer. Solder this last washer to the 1/16 in. diameter wire. Cut wire extending out back of handle to approximately ¾ inch. Cut ¾-inch lengths of telescoping brass tubing, the largest diameter to be 3/16" O.D. Overlap each tube about half its length and sweat solder together and on end of wire extending out back of handle. Cut flat brass extension for securing Mono-Line twist wire and solder to top and bottom of 3/16 in. tube extension with ends extending past end of tube far enough to provide for small through bolt to secure Mono-Line twist wire. Drill through both extension pieces for 4-36 screw. Cut 1/16 in. diameter wire extending out front of handle to 1-½ or 2 inches and attach hook-up clip securely. This completes the handle. This wire assembly through handle must turn freely and be in line when turned.

The Mono-Line twist wire and actuator

(*Continued on page 61*)

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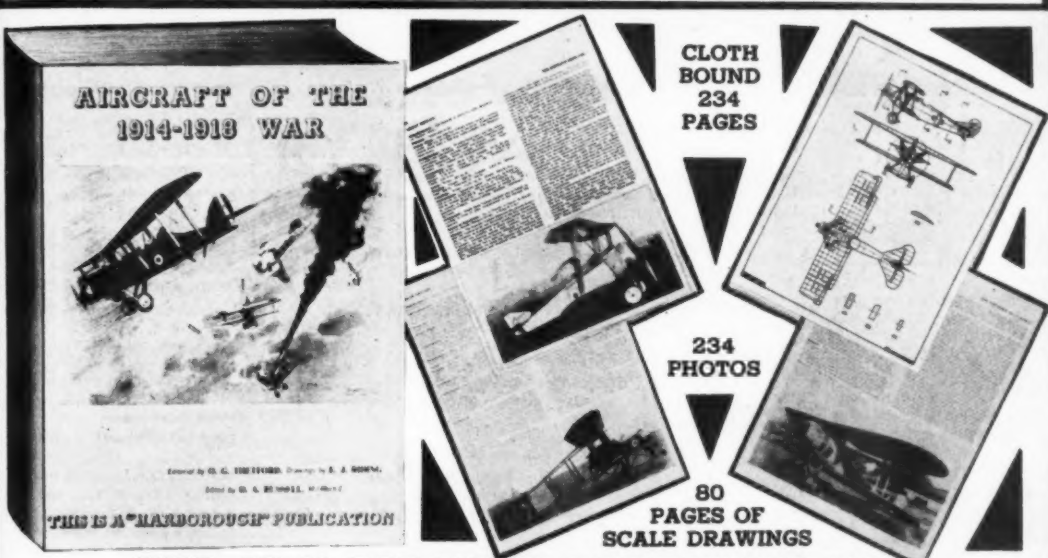

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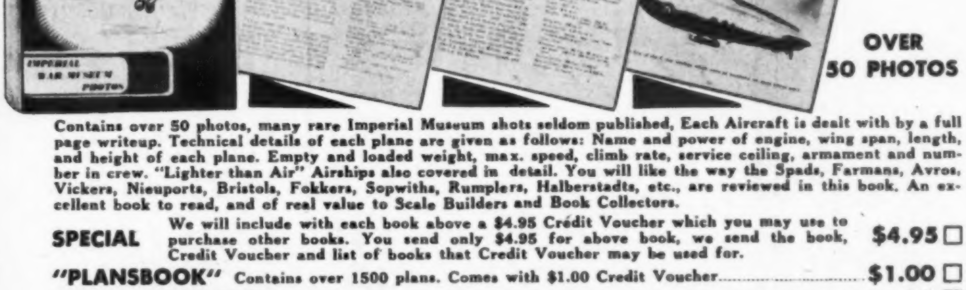

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Greatest Multi RC of all time—a beauty!

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DOUGLAS B-66: ducted fan FF, .049.
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BREEZY: Small field RC, .049.
SPITFIRE: Stunt, semi-scale, .29-.35.
P. Schoenky, 'copter master—his Sikorsky!

13. T-CRAFT: FF scale, .049.
FENO: Combat, stunt, .29-35.
PADDY'S WAGON: Contest FF, .049.
Paddy's Wagon—one contest job ok for beginner.

14. HEATH PARASOL: RC, FF, Scale, .075 .09.
GUARDIAN: Nats carrier winner, .29's.
SHARPIE: FF Sport, .02-.049.
—Guardian a dilly.

15. RE-8: WW1, U/C. .29-.35.
FLAPPING WINGS: Rubber, ornithopter.
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Ruffy: big winner—it's new!

47. FOKKER E-3: 1/2A, FF, Scale.
NAVY RACER: Rubber, semi-scale.
WOODY: .29-.35, UC Combat. Hot!
E-3, beautiful model, fine flier.

48. SPORTCOUPE: .09, U/C, Stunt.
WHATIZIT: .35, Combat, Wooten.
SWIF-F-FT: Jetex, two sizes!
Whatizit, settles fuse-wing debate!

NO STAMPS PLEASE **PLAN SETS 50c p.p.**

MODEL AIRPLANE NEWS • 551 FIFTH AVENUE, NEW YORK 17, N. Y.

Enclosed is ________ for plan sets numbered in boxes below

PLAN SET #	PLAN SET #	PLAN SET #	PLAN SET #	PLAN SET #	PLAN SET #

Please print your number DISTINCTLY in box for each plan you desire.

PLAN SET #	PLAN SET #	PLAN SET #	PLAN SET #	PLAN SET #	PLAN SET #

List additional plan orders on separate sheet.

NAME ________ PLEASE PRINT

ADDRESS ________

CITY ________ ZONE ________ STATE ________

Limited Supply of Plans Listed Below. Order Early! Check Correct Number on Coupon.

5. Space Tiger, Curtiss Racer, Puss Moth
17. Half Fast, Perdido, Shoreboat
22. Mooney Mite, '55 Rambler, Waco Cabin
23. Humdinger, Old Faithful, Cessna 180
24. Aero Bat, Snoopy, Seagull
26. Corsair, Gyro-Glider, Santanita
27. Flamingo, Upstart
29. Cougar, '55 Nordic Winner, Dizzy Boy
30. Great Lakes Trainer, Triple Threat RC
32. Mig-15, Fifinella, Coquette
33. Skyraider, Dunwoody's Nordic, Flexi-Bull-It
34. Corben Super Ace, Cessna 310, Profile Lightning
36. Stunt Trainer, ABC Robin, Blitzen
38. SE-5, Curtiss Robin, Nobody
40. Mustang, Bi-gone, Gliders 5

are standard with no modifications. Remove the plastic handle from either a standard or speed model of Mono-Line twist wire. Slip the hook-up end of this twist wire into telescoped tubing extending out back of control handle. (If necessary, flatten telescoped tube slightly to admit hook-up end of twist wire.) Securing screw goes through tube extension and through loop formed in end of twist wire. Hold flying handle in one hand and operate twist wire actuator on twist wire. This assembly must operate smoothly and must not oscillate.

There are any number of simple ways to make hook-up between lead out, control horn, and throttle used. However, if rotor or butterfly type, is used the action has to take a right angle. Therefore the right angle bellcrank shown in pictures and in schematics. If you use a motor with exhaust stack on side opposite lead outs, make hook-up as shown except make pivot for right angle bellcrank extend from lead-out side of fuselage through to opposite side, then add another control horn to opposite end of this pivot. Connect from this control horn up to exhaust throttle.

Make all adjustments so that pulling back on twist wire actuator gives high speed. This is the throttle setting you may want to get in a hurry to stay out of the "drink" and this operation of twist wire actuator is least difficult to perform.

Make flying line for special lead out from .018 or .021 solid wire (standard Mono-Line typical). Make two hook-up clips similar to those already used, hook and securely solder these, one on each end of this solid flying line. Connect special lead to pivot assembly of handle using this solid flying line. For second flying line use standard flexible line of size required. Make hook-up connections in conventional manner.

Flying is as close to conventional two line U-control as possible.

LIST OF MATERIALS

Veco or Perfect bellcrank (size required): 3x3 sheet brass 1/32 in. thick; two small ball-bearing thrust washers; two large ball-bearing thrust washers; 36" length of 1/32 in. diameter, straight, solid wire; 6" length of 1/16 in. diameter, straight, solid wire; one length of .018 or .021 solid wire (Mono-Line); one length standard flexible flying line; 2" of 1/16" O.D. brass tubing; 1" of 3/32" O.D. brass tubing; 1" of ⅛" O.D. brass tubing; 1" of 5/32" O.D. brass tubing; 2" of 3/16" brass tubing.

FIGHT CANCER

AMERICAN CANCER SOCIETY

25¢ THIS COUPON WORTH 25¢ 25¢

GET A 25¢ NYLON PROP FREE! To help introduce our new Swordsman (described below), I'm offering a practically indestructible 25¢ 6-3 nylon propeller, just right for this model . . . absolutely FREE! It's this easy: buy the Swordsman at your dealer, and send me its name off the FRONT of the box along with this coupon. That's all you do! We'll immediately send you your FREE NYLON PROPELLER! This limited offer is good only until August 31, 1958. So . . . don't delay — see your dealer today!

SWORDSMAN-18

FOR .020 TO .049 GAS ENGINES

THE NEWEST CONTROL LINE MODEL BY — Carl Goldberg

$1.49

DIE-CUT INTERLOCKING ALL BALSA CONSTRUCTION

18" WINGSPAN

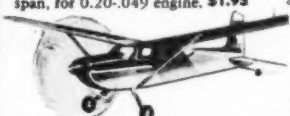
FIELD TESTED AND PROVEN FOR CONTROL LINE

Dear Modeler:
Have you ever wished for an easy-to-build ½A control model with ENOUGH WING AREA to fly well? And a RUGGED engine mounting? And the landing gear far enough forward? And a working rubber tail-wheel? Well, you'll find all these and still more features in my new Swordsman-18! It's speedy, sturdy, stable-flying and responsive — easy on the beginner, and a pleasure for the more experienced flyer. Wingspan 18", length 14", for .020 to .049 gas engines. Fully prefab construction (no paper), with all die-cut, interlocking balsa and plywood parts, formed landing gear, rubber wheels, large and colorful decal, plastic canopy and step-by-step illustrated plans. Now being delivered to your dealer — only $1.49.

RANGER 30—Die-cut balsa, 30" span, for 0.20-.049 engine. $1.95

½A BLAZER—Die-cut balsa, tissue. 40" span, for .049 engine. $2.50

RANGER 28—My "pre-fab plus paper". 28" span, 2 colors $1.00



CESSNA 180—The champion of business liners. 21" span. $1.00

SHOESTRING RACER—18" span. All die-cut balsa. Complete $1.00

RANGER 21—All die-cut balsa parts. 21" span beauty. $1.00

SPIRIT OF ST. LOUIS—A miniature duplicate. 21" wingspan. $1.00

Carl Goldberg

P.S. If no dealer near you, send me cost of plane plus 25¢ each for postage and packaging. Or send cost of any three and I'll pay the postage.

CG

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hobby spray gun

operates from vacuum cleaner

The ideal spray gun for modelers, hobbyists, and the do-it-yourself fan . . . paint your model planes, cars, trains, boats, display shelves, etc. For that "finishing touch" get the Hobby Spray Gun . . . and it's

• Simple to operate • Direct spray (minimum waste)
• One filling covers 10 sq. ft. • Nickle plated • No moving parts
• Always in adjustment

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sprays dope • vinyl • lacquer • enamel • water base paint

Faster, Easier, with Smoother Finish

Comes complete with hose and attachments to vacuum cleaner

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DYNA-JET

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If you can't get a Dyna-Jet miniature gasoline engine at your hobby shop . . . or if there are no hobby shops near you . . . we're now set up to "shoot" you one direct from our production line.

You know its reputation . . . know it holds all world records for jet models. This year, put *your* plane out in front . . . with Dyna-Jet!

Price: **$35.00**

- Weight: Only 16 oz.
- Develops 4¼ lb. Thrust
- Fast Starting
- High Resale Value

Send check or money order—your Dyna-Jet will be sent promptly, parcel post paid. (Reference: Citizens National Bank, Bedford, Ind.)

Curtis — Dyna Products Division, AUTOMOTIVE DEVICES, INC.
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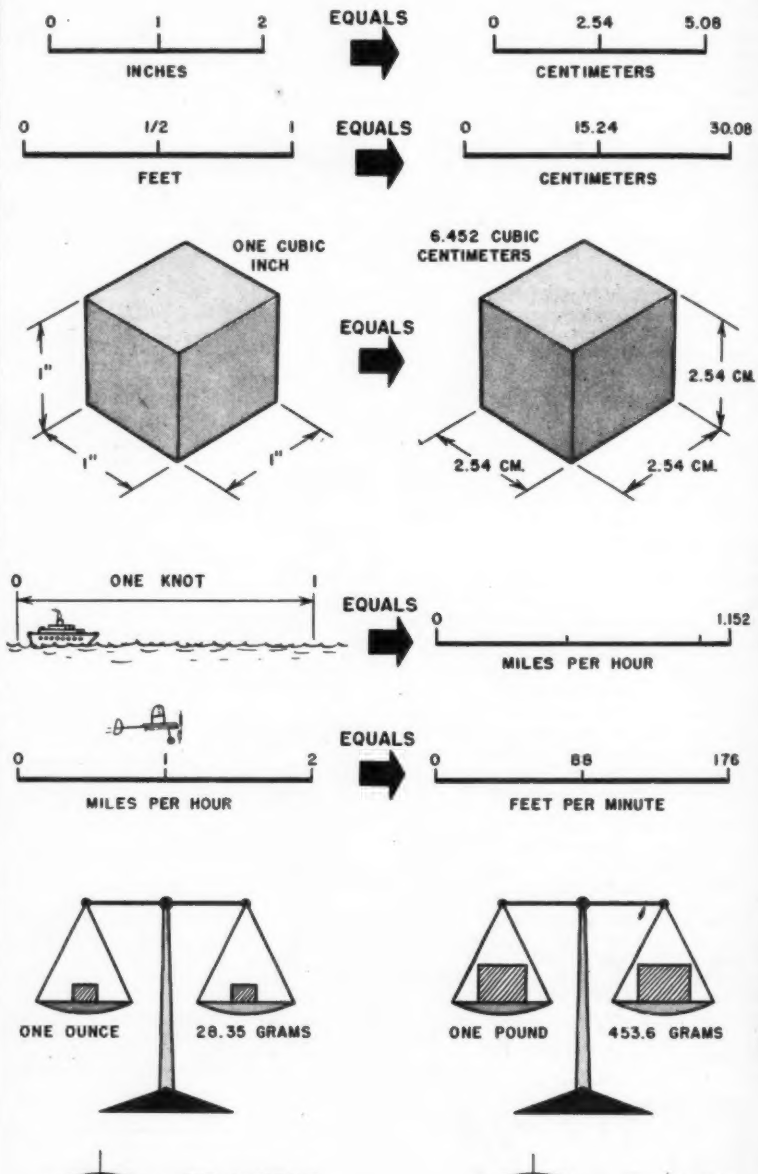


P.D.G.

RADIO-CONTROL ... FREE-FLIGHT ... CONTROLINE

NEW...

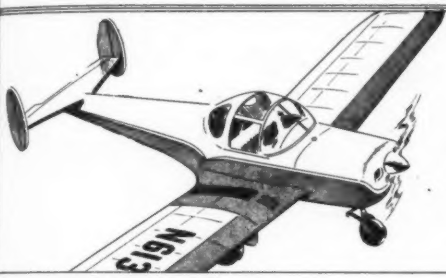
KING SIZE SCALE:

For Radio Control Pylon Racing - Controline Flying

"BUSTER"

For .15 to .35 Engines — 3" Scale — 48" Wingspan **$9.95**

First scale model kit for Radio-Control Pylon Racing, - also for Controline flying. 1/4 size of real 16' wingspan "Buster" racer. Kit No: 3-8



Forney

"AIRCOUPE"

For Radio Control— Free-Flight— Controline

Kit No: 3-7 '1½" Scale .074 to .29 Engines

$6.95

As much fun as it is to fly-it may be built as a free-flight, radio or controline design. Stable and easily adjusted as a free-flight, rugged and fun to fly. As a radio design-ideal for rudder and motor control, with the data on plans. A truly practical scale design for rough and ready controline flying.

"KING SIZE FLYING SCALE"

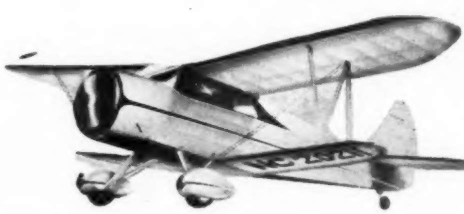
"WACO CABIN"

For Radio Control—Free-Flight—Controline

1½" Scale —52" Wingspan

For .14 to .29 Engines Kit No: 3-6 **$9.95**

The 1½" scale "Waco" spans 52". Weight with all radio equipment installed is 4½ lbs. 630 sq. inches wing area. Model is designed for multiple control through compound escapement systems. In flight it is very stable and easily controlled with rudder only type installations. Rudder, elevators, motor and steerable tailwheel may be actuated. Radio equipment is removable as a unit for convenience.



"CESSNA 172"

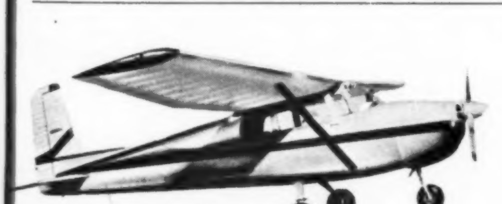
BIG 1½" SCALE

54" WINGSPAN FOR .09 to .19 ENGINES

- Adjustable Ailerons — for manually setting trim
- Laminated Structure — stronger, lighter, easier
- Operating Wing Flaps — radio or controline actuated

$8.95

Here is the latest scale "Cessna" that is a "natural" for radio control. The big proto ship takes-off and lands with "hands-off" control. The model handles just as easy! It's a model builders dream ship!



The kit is very complete in true Berkeley tradition with prefabricated wood parts, silkspan, landing gear and hardware, plus the super-detailed plans and full-colored authentic decals found only in Berkeley Kits.

"KING SIZE FLYING SCALE"

1½" Scale — 54" Wingspan

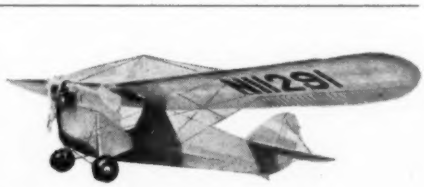
AERONCA "C-3"

For Radio Control — Free-Flight — Controline

.099 Engines R.C. — .074 Free-Flight — .15 Engines Controline

Kit No: 3-5 **$5.95**

Designed for rudder control with optional elevator and motor control. Ailerons can be set for trim All equipment easily accessable through the cabin. Controline version is fun to fly with motor control.



Radio Control — Free-Flight — PAA-Load

.15 to .25 Engines—71" Span—2" Scale

"PIPER CUB J-3" $9.95

The "Piper Cub J-3" needs no introduction. Most famous of all light aircraft, it's a natural for R.C. or Free-Flight flying. The six foot span permits the extra R.C. installation that you dream about. This is a rugged, detailed, flight proven design. Full-Size Plan with R.C. installations, Authentic Decals, etc.

1½" = 1' Scale — 44" Wingspan
For .035 to .15 Engines

Piper

"TRI-PACER" $5.95

This perfect scale R.C. design may be built as a Free-Flight or Controline version if desired. Full Size Plans cover special details for all three versions. Flaps, elevator, rudder, motor and nose gear may be operated by R.C. Ailerons for trim, cabin door access to Radio, Highly Pre-fabricated, Authentic Decals.

Berkeley's

RADIO CONTROLLED FLYING SCALE Designs

CESSNA "170"

$13.95

Radio Control — Free-Flight — PAA-Load
.35 to .35 Engines — 72" Span — 2" Scale

Controlling your "Cessna 170" by Radio is a thrill you will not forget! Perfect in scale, rugged, stable in all attitudes, yet responsive in control, with good wind penetration qualities. The gear location is ideal for extended take-off runs. The larger than average size makes it easier to control in windy weather.

1" = 1' Scale — 48" Wingspan
.035 to .15 Engines

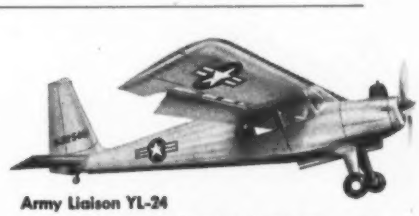
$4.95

De Havilland

"BEAVER"

• Formed Metal Ring Cowl

This high aspect-ratio Canadian Bush Flying type aircraft now is in use by the U.S. Air Force. As a scale design, it is well proportioned and capable of contest performance. In R.C. and Controline flying, its long moment arm make it ideal for spot landings with motor control, Metal Cowl, Full Size Plans, etc.



Army Liaison YL-24

"HELIOPLANE" $3.95

Variable Camber Wing for Two-Speed Radio Control Flying

For .049 to .14 Engines — 39" Wingspan — 1" Scale

"Helioplane" is first model that permits use of scale flaps. Depress 10 degrees for free flight; 25 degrees for slow speed control by radio; or raise 5 degrees for high speed.

NAVION "Super 260"

2" Scale — 68" Wingspan For .23 to .65 Engines

This beautiful scale replica of the famous "Navion" is a fast, rugged and truly different R.C. or Free Flight design, easily adapted to Controline Flying. Thrill to its flashing performance and smooth response. As a free-flight, it will give you experience and confidence in low wing designs. Big, roomy, and well engineered, it will set the pace whenever it's flown. Easy to build!

$15.95

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easy to build...

authentic in detail...

a fine flyer...

"MODEL OF THE MONTH"

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- Rounded Edge Balsa Planking Strips
- Shock Mounted Landing Gear
- Formed Metal Ring Cowl
- Rubber Wheels, Hardware
- Die-Cut Balsa and Plywood
- Plastic Dummy Engine Cylinders
- Authentic Full Color Decals

$5.95
Kit No: 7-4

Controline

For .09 to .19 Engines

33" Wingspan

3/4" Scale

Curtiss A-12

"SHRIKE"

HISTORICALLY FAMOUS ATTACK FIGHTER

Developed by Curtiss Aircraft in the middle 30's, the "Shrike" was considered to be one of the outstanding aircraft of its day, and greatly influenced all future pursuit aircraft design. Some of its features included four .30 cal. machine guns in the gear fairings, one in aft cockpit, automatic slats, and wing flaps. Powered by a 670 hp. Wright Cyclone. Top speed was 195 m.p.h.

Look no further if you want a fine flying historically famous flying scale design. Its unusually long tail moment arm, with large tail surfaces, rugged shock mounted gear, operating flaps and rugged structures throughout, make this a perfect design for the rigors of everyday sport flying, as well as the scale events, where technical accuracy, detail and performance are essential.

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Announcing . . . the ALL NEW FOX 15 for 1958

ONLY $6.95

Never before has FOX manufactured a 15 . . . but now after two years of producing and testing experimental models, the ALL NEW FOX 15 is waiting for you at your favorite hobby shop.

To prepare for the production of this new FOX 15, the company has moved into its new factory with approximately 43,000 feet of floor space. New machines have been purchased and operators have been re-trained for work on this model. Everything has been done to facilitate the manufacture of a FOX 15 of superior precision and operation. Initial tests indicate the new FOX 15 will almost equal the 19's in performance.

SPECIFICATIONS

BORE: 590 STROKE: 530 WEIGHT: 4 oz.

RPM: 14,000 with 8" diameter, 4" prop.

1. **HARDENED AND GROUND CRANK SHAFT**
2. **⅜" DIAMETER MAIN BEARING**
3. **LEADED STEEL CYLINDER—GROUND, HONED AND LAPPED**
4. **FOX QUALITY THROUGH AND THROUGH**

The New FOX 15 is not just a new motor; but an entirely new concept of motor design, performance and value. It brings big motor performance within the financial reach of the beginner. The New FOX 15 is unique in construction, unique in design, unique in value and in ability. Try one and see for yourself.

With the New FOX 15, you get a motor powerful enough to fly kits designed for larger motors at a cost only slightly more than the average half A. Never before could a modeler enjoy so much big engine performance so inexpensively.

OUR PREDICTION: In the years to come, this motor will become the standard of the Sport Flying World.

ORDER YOUR NEW FOX 15 MOTOR RIGHT AWAY—

YOU'LL BE GLAD YOU DID

SMART CHAMPIONS CHOOSE FOX

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NEW—BIGGER SIZE!
SAME LOW PRICE!

FULL PINT—16 oz. SELF-SPRAY

STILL $1.79

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Aero Gloss
NEW FORMULA

ECONOMY PINTS
Now in colors!
$1.79

Also available in 20¢, 60¢ and $1.00 sizes

Modern modelers know that *new formula* AERO GLOSS gives them *3 times more* pigmentation buildup per coat—which means more cover, less work! A *new formula* AERO GLOSS finish *lasts longer* because it has 28% increased protection against today's hot fuels! And its *true airplane dope base* is more pliable—prevents cracking or chipping! Whether you brush or spray—follow the lead of champions—use *new formula* AERO GLOSS!

"Aero Gloss is the perfect finish for flying scale", says Chuck Hollinger—seen here with his **Jetco** Fairchild PT-19 with **Babcock** radio control. Experts like Chuck—who is America's most famous R/C Scale model designer—insist on the best model finishes available—which, Chuck says: "Naturally means Aero Gloss by Pactra!"

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PINTS 98¢

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Power Fuel—with Lubex 27—keeps engines running cleaner, longer and running COOLER, for the best protection against damaging overheating, scoring & seizing.

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